

Red Line/Blue Line Connector Project

Boston,
Massachusetts

Massachusetts Department of Transportation
Boston, Massachusetts



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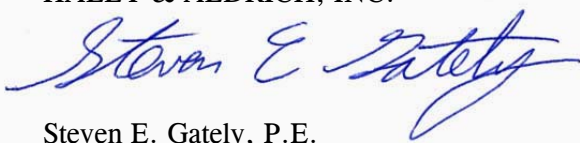
Subject: Geotechnical Data Report
MBTA Red Line / Blue Line Connector Project
Cambridge Street
Boston, Massachusetts

Ladies and Gentlemen:

We are pleased to submit herewith our report titled "Geotechnical Data Report, MBTA Red Line/Blue Line Connector Project," prepared in accordance with our subcontractor agreement signed 13 March 2009.

This report is a compilation of existing geotechnical data previously developed for the MBTA and data from private developments adjacent to the project alignment.

Sincerely yours,
HALEY & ALDRICH, INC.



Steven E. Gately, P.E.
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1. INTRODUCTION

1.1 General

Haley & Aldrich, Inc. (Haley & Aldrich) has prepared this Geotechnical Data Report (GDR) in support of STV Inc.'s (STV) conceptual design of the proposed Massachusetts Bay Transportation Authority (MBTA) Red Line/Blue Line Connector Project, in Boston, Massachusetts. The proposed project would provide a connection between the only two lines that do not intersect on the MBTA's rapid transit system and involves construction of a tunnel along Cambridge Street from MGH/Charles Station to Bowdoin Station. Figure 1 shows the project location.

This GDR is part of a Draft Environmental Impact Report and Alternatives Analysis. It summarizes geotechnical soil and foundation data from previous geotechnical engineering studies for the MBTA and private developments along the tunnel alignment. No new subsurface explorations were conducted as part of this study. The report is intended to supplement and update previous reports that have been prepared for earlier versions of the Red Line/Blue Line Connector Project and to provide sufficient information for the current tunnel alternatives being developed to the 10 percent design level. This GDR is not intended to be a stand-alone document.

Most of the relevant geotechnical data are contained in two reports previously prepared for the MBTA that are available as part of the data collected for this project. The two reports are the 1987 GZA Geotechnical Data Report and the 2001 GEI Geotechnical/Environmental Report. These two reports should also be reviewed by the reader. This Haley & Aldrich GDR also summarizes data from various private developments along Cambridge Street not previously included in the reports prepared for the MBTA.

Geotechnical engineering recommendations (developed to the 10 percent design level) are presented in our separate Geotechnical Interpretive Report. A Preliminary Groundwater Management Plan has also been prepared by Haley & Aldrich.

1.2 Proposed Tunnel Alternatives

Through an alternatives analysis process (documented elsewhere), the design alternatives have been reduced to two Build Alternatives and a No-Build Alternative. Both of the Build Alternatives involve a predominantly mined tunnel in combination with a relatively short section of tunnel constructed using the cut-and-cover construction technique. The bottom of the mined tunnel will be at approximately El. 63 (MBTA datum) in the Charles Circle Area and at El. 85 at the mined tunnel terminus near the existing Bowdoin Station. The depth of the tunnel invert is approximately 50 to 60 ft below existing grade. The geotechnical aspects of the two Build Alternatives are discussed in detail in the Preliminary Geotechnical Engineering Report.

1.3 Previous Geotechnical Studies

In 1986, Haley & Aldrich was part of the STV/Seelye Stevenson Value & Knecht team that completed the precursor study for the Red Line/Blue Line Connector, known as the "Bowdoin Station & Charles Station Connector Project Feasibility Study."*

*All studies referred to in this report are referenced in the bibliography section of the report.

In 1987, additional engineering and planning studies were performed for the project by the Howard Needles Tammen & Bergendoff/Thomas K. Dyer, Inc., design team, who prepared a multivolume report titled "Preliminary Design and Environmental Studies Status Report." Volume V of the report is a Geotechnical Data Report prepared by Goldberg-Zoino & Associates, Inc. (GZA). The results of 25 geotechnical borings conducted for the project are presented in the GZA Geotechnical Data Report. The report also presents a subsurface profile along the proposed 1987 cut-and-cover tunnel alignment based on historic boring data and the explorations performed as part of that study.

In 2001, GEI performed geotechnical subsurface explorations and developed soil profiles in the Charles Circle area in support of design efforts for the new Charles/MGH Red Line Station.

Subsurface explorations have been conducted in the general vicinity of the tunnel alignment for MGH (Massachusetts General Hospital) construction projects and for various private developments. Some of these data have been located and are included in this report.

1.4 Elevation Datum

All elevations in this report are referenced to MBTA Datum (105.62 MBTA = 0.0 NGVD) unless specifically noted otherwise. All stationing referred to in this report is with respect to the modified Cambridge Street stationing as shown on the Exploration Location Plan, Figures 2 through 5.

2. SUBSURFACE EXPLORATIONS

Test boring explorations from a variety of sources are included on the Subsurface Exploration Location Plan (Figures 2 through 5):

- The borings shown on GZA's 1987 Exploration Location Plan, including the 25 GZA explorations and the historic borings, are also shown on Figures 2 through 5. To allow for differentiation with other sources of information, the data collected by GZA are color coded black.
- GEI performed six borings and two test pits in the Charles Circle area. The locations of the GEI test boring explorations along with additional historic boring data presented by GEI (and not already presented by GZA) are coded green.
- The locations of explorations presented in a McPhail Associates, Inc. (McPhail) geotechnical report for the MGH Yawkey Parking Garage are coded blue.
- Haley & Aldrich explorations from various sites along the alignment are coded purple. Historic explorations from the 1986 report are also presented in purple where they are not redundant with explorations presented by others.

The GZA and GEI reports referenced above, which include exploration logs, are available as part of the data collected for this project. Appendix A contains the boring logs for the exploration locations shown in blue or purple, referenced above.

3. SUBSURFACE CONDITIONS

3.1 Colonial Shoreline and Geologic Setting

The project alignment along Cambridge Street is located at the foot of, and along the north edge of, Beacon Hill. The general site topography is shown on the Exploration Location Plan (Figures 2 through 5). Note that the ground surface elevation at the west end of the alignment in the Charles Circle area is at about El. 107 while the ground surface in the area of the existing Bowdoin Station is at about El. 143.

In geologic terms, Beacon Hill is primarily a glacial moraine. According to “Roadside Geology of Massachusetts” by James W. Skehan, Beacon Hill “is a complexly faulted mass of well-bedded sand, interbedded sand and clay, gravel, and till. A series of north-dipping slabs of glacial materials have been thrust over one another like an imbricated package of dominoes.” The soil slab thrusting is thought to be caused by the glacial movement of frozen soil.

Glacial outwash is also found along the flanks of the moraine. Marine and estuarine deposits mostly consisting of silty clays and organic silts, blanket the low-lying areas around Beacon Hill and the original Shawmut Peninsula upon which early Boston was settled.

The original colonial shoreline crosses Cambridge Street at approximately North Anderson Street, as shown on Figures 2 and 3. The land area west of North Anderson along Cambridge Street is filled land that was once below the tide level.

3.2 Subsurface Profiles

Figures 6 through 9 present generalized soil profiles along the length of the tunnel on both the north and south sides of Cambridge Street, from the west end of the proposed trail tracks to the Government Center MBTA Station. Figures 10 through 12 show Sections A, B and C cut perpendicular to the proposed tunnel alignment along Cambridge Street. The soil profiles and sections are based on data from a wide variety of sources and time periods. Geologic strata are, in some cases, described differently by different investigators. Haley & Aldrich has done its best to interpret the geologic strata based on the logs and without the benefit of seeing the soil samples. Given the source and age of some of the data and the apparently complex geologic setting, significant variations in actual conditions to those presented here should be expected.

Not all of the borings shown on the Exploration Location Plan were used to develop the subsurface profiles presented. Borings not shown on the profiles were not used because they were too far away from the project or redundant with a nearby boring. Note that most of the older boring logs do not report Standard Penetration Test N-values and that not all strata were encountered in every boring.

The cut lines for the North Profiles (on the north side of Cambridge Street) and the South Profile (on the south side) are as shown on Figures 2 through 5. Cambridge Street Stationing is used along the length of both profiles. To the east of Sta. 10+00, the stationing is the same for both the north and south profile. To the west of Sta. 10+00, however, the profile stationing differs for the north and south tail track due to the diverging alignments.

The 2001 GEI report discusses subsurface conditions in the area of the Charles/MGH Red Line Station, provides cross sections, and contour plans of the tops of the marine clay and glacial till. Haley & Aldrich has not found any significant additional boring data that is not reported in GEI's 2001 report in this area. The profiles developed for this report differ in the Charles/MGH Red Line Station area from those prepared by GEI only in where the profile lines are cut, but the subsurface conditions displayed do differ significantly because of the profile alignment.

The general characteristics of each stratum are described below.

3.2.1 Fill

A surficial layer of miscellaneous fill blankets the entire tunnel alignment, ranging in thickness from a few feet to about 23 ft. West of Sta. 13+00, the fill ranges from 10 to 23 ft thick while east of Sta. 13+00, the fill ranges in thickness between a few feet and 10 ft.

The miscellaneous fill is characteristically variable in density from loose to medium dense and is heterogeneous and intermixed but predominantly granular. In addition to sand, gravel, silt, and clay soil particles, the fill contains miscellaneous materials such as brick, ash, wood, cinders, coal, paving stones, and concrete rubble. Numerous obstructions were encountered in the fill.

3.2.2 Organic Silt

The organic silt stratum is of tidal marsh origin and generally consists of loose to very loose organic silt, silty fine sand and fibrous peat. It may also contain shells, little to trace clay, and/or coarse sand and gravel.

The Standard Penetration N-values in the organic silt are nearly all less than 10 indicating a very soft to medium stiff cohesive soil or a loose granular soil.

3.2.3 Marine Clay

Commonly referred to as the Boston Blue Clay, the marine clay encountered at the site is predominantly very soft to very stiff silty clay with interbedded sand and gravel. This deposit typically exhibits an upper desiccated yellow silty clay layer containing a higher proportion of sand and gravel lenses grading into a blue silty clay below. The upper desiccated crust is not present in all locations, however.

The Boston Blue Clay in the Charles Circle area was recently characterized by GEI through geotechnical laboratory testing as having an undrained shear strength ranging from 770 to 990 psf in UUC tests. Using the SHANSEP method, GEI estimated that the undrained shear strength of the clay ranged from 1.2 to 1.4 ksf. GEI used an undrained shear strength of 1.1 ksf for their design of minipiles for the Charles/MGH Red Line Station.

3.2.4 Marine Sand

This stratum is labeled silty sand and gravel on both GZA's and GEI's subsurface profiles. It is shown as marine sand on the profiles prepared for this report to reflect our best judgment of its geologic origin.

The deposit is discontinuous and found in two general areas. From approximately Sta. 17+00 to approximately Sta. 10+00, there is a deposit of fine to medium sand with varying amounts of silt and gravel between the top of the glacial till stratum and marine clay stratum. This stratum appears to be predominantly on the north side of Cambridge Street in this area. West of Sta. N8+00 in the north tail track area, there is a stratum of very dense silty sand and gravel between the marine clay stratum and the organic silt stratum.

Although located on opposite sides of the marine clay stratum, these two marine sand deposits appear to have been laid down at about the same elevation, between approximately El. 55 and El. 80 and are both assumed to be of marine origin.

The marine sand at the site can be described as being predominantly medium dense to dense, fine or fine to coarse sands and gravel with between 0 and 35 percent silt. Interbedded fine sand and clay were encountered in one boring.

The proposed tunnel will have an invert at about El. 63 in this area and will likely intersect the marine sand stratum in some locations. Grouting of this stratum will likely be necessary ahead of tunnel advancement due to its relatively high permeability.

3.2.5 Glacial Till

According to the 1987 GZA Data Report, “The glacial till stratum consists of medium dense to very dense silt and clay to silt with varying amounts of fine to coarse sand and gravel. The borings indicate that the till is more granular in the eastern part of the alignment than in the western.” The more recent GEI borings generally confirm this description; however, cobbles and boulders were also encountered in the GEI borings.

The elevation of the top of the glacial till varies widely both in the east/west and north/south directions as shown on the profiles.

3.2.6 Possible Glacial Moraine Deposits

Two strata shown on the soil profile developed for the 1987 GZA Data Report have been reclassified in this report as belonging to “Possible Glacial Moraine Deposits.”

Based on Boring BC-19, GZA describes a “Clayey Sand and Gravel” stratum. The stratum, located below the marine clay and above the glacial till, is described as having “Varying amounts of gravel, fine to coarse sand, silt and silty clay ... Blow counts indicate that the stratum is very dense ...” GZA states that this soil could be glacial till but that it is more granular and therefore more permeable than other glacial till encountered in the project area. Haley & Aldrich agrees that this soil could be part of the glacial till stratum. However, it was judged that this stratum may have been transported and altered since deposition. Therefore, we have included it on the profiles within the more loosely defined “Possible Glacial Moraine Deposits” Stratum.

The second stratum that is being classified in this GDR as “Possible Glacial Moraine Deposits” was described in the 1987 GZA Data Report as “Interlayered Sand and Silty Clay consisting of medium dense to very dense fine to medium sand with 1/8-in. lenses to approximately

5-foot thick layers of silty clay, fine to coarse sand and gravel encountered in areas.” This soil zone has been reclassified as “Possible Glacial Moraine Deposits” in the GDR to reflect the most likely mechanism of formation. It is judged that that this stratum consists of glacially up-thrust soil layers that are typical geologic features of Beacon Hill.

The deposits described as “Possibly Glacial Moraine” on the Haley & Aldrich profile are medium dense to very dense or medium stiff to very stiff and should be considered potentially high permeability zones, although thick layers of silty clay exist within the stratum in some locations. Overall, we interpret that the glacial moraine deposits will be highly variable in gradation, ranging from clay to sand with cobbles and boulders. The contacts / strata breaks within this unit are expected to be chaotic, exhibiting evidence of deformation, including folding and faulting.

3.2.7 Bedrock

GEI (2001) describes the bedrock as follows:

“The argillite encountered in the borings is fine grained and very thinly bedded and is moderately to severely weathered (kaolinized). The bedding is generally moderately to steeply dipping, with dip angles ranging from about 35 to 60 degrees. Tuffaceous sandstone was encountered in one of the GEI borings (G-4). The sandstone is hard, slightly weathered, and fine-grained.”

More detailed descriptions of the rock cores performed to date in the area are provided in the GEI (2001) and GZA (1987) reports.

Haley & Aldrich compared the bedrock elevations suggested by the borings with USGS map prepared by Kaye (1970) and there appears to be general agreement in most areas. The tunnel is expected to be above the top of bedrock. However, there are a few areas where the top of bedrock elevation approaches the bottom of the proposed tunnels. Therefore, further investigation for the top of bedrock elevation will be required for final design.

3.3 Groundwater

Haley & Aldrich reviewed hydrogeologic data from various sources, including files of projects completed in the vicinity of the Site, and Boston Groundwater Trust (BGWT) data. The following observations are based on the available information:

- Water table elevations in observation wells near Joy Street (BC-17 and BC-19), which were measured multiple times from March to October 1987, ranged from approximately El. 114 to El. 117.
- During this same time period, groundwater elevations in shallow, water-table wells near Charles Circle (BC-1 and BC-2) ranged from El. 105.5 to El. 111.
- Shallow groundwater elevations have been measured at El. 103.5 in the vicinity of the Boston Marginal Conduit and the West Side Interceptor, which are oriented roughly north-south across the eastern limits of the project area. Seepage of groundwater into these structures and their

associated underdrains is the likely cause of the localized lower groundwater elevations in this area.

- Higher water table elevations are expected in the areas of higher ground surface elevation north and south of Cambridge Street.
- Water table elevations in the area of the proposed cut-and-cover section of the tunnel are expected to range from El. 118 to El. 122; however, this range is based on very few data points in the area. Ground surface elevation in this area appears to be between about El. 145 and El. 140, so the ground water table is about 20 to 25 ft below the ground surface.
- Groundwater elevations measured in deeper strata ranged from El. 107.6 to El. 108.8 at piezometer BC-3, to El. 110.3 to El. 122.0 at piezometer BC-22.

Based on these data, both the shallow water table elevations and piezometric heads below the silty clay stratum in deeper strata generally decline from east to west along Cambridge Street. Most of the available groundwater level data predates construction of Boston's Central Artery Tunnel project which may have impacted groundwater levels in the area. Groundwater levels will vary seasonally and in response to pumping stresses from construction dewatering and pumping wells, and infiltration to (or exfiltration from) utilities that are below the water table.

3.3.1 Potential Effects of Dewatering

Construction dewatering within the limits of the proposed work may affect both shallow and deep groundwater flow regimes. The area with the highest pumping rate required for dewatering will likely be the eastern section of the proposed tunnel extension, because the excavation will most likely be supported with a soldier pile and lagging system using cut-and-cover techniques and the excavation will extend about 20 to 35 ft below the groundwater table. This area is still being evaluated to see if there are negative effects to temporarily lowering the ground water level. If necessary, a relatively impermeable support-of-excavation system can be used to limit the amount of groundwater drawdown.

Based on experience with temporary dewatering systems and permanent underdrains in the Boston area, pumping stresses in the deep strata (i.e., glacial till, bedrock) may affect groundwater levels over a broad area.

Due to the presence of shallow wood-pile foundations and compressible soils, potential drawdown effects, including drawdown-induced settlement, should be evaluated and considered in the final design.

3.3.2 Groundwater Conservation Overlay District

The limits of the project appear to extend into the BGWT Groundwater Conservation Overlay District (GCOD). The project is therefore subject to GCOD regulations, which require submittal of a building permit application to the Inspectional Services Department (ISD), who, in turn, requires a conditional use permit from the Boston Zoning Board of Appeals (ZBA). To comply with the GCOD, the project must provide certification by a Massachusetts Licensed Professional Engineer (P.E.) that the project will not lower groundwater levels at properties within the GCOD. The ZBA may require recharge mitigation, which entails design and

construction of a system to infiltrate water to the subsurface. The process for compliance with the GCOD, which includes appearance before the ZBA, requires approximately 6 months.

3.4 Potential Obstructions

There are numerous natural and man-made sources of potential obstructions along the tunnel alignment.

Glacial deposits, particularly glacial till, often have cobbles and boulders that could interfere with construction of access shafts and tunneling operations. There also could be high bedrock in some areas, although the explorations to date have shown that the proposed tunnel alignment is above the top of bedrock elevation.

The area east of North Anderson Street along Cambridge Street was, in colonial times, part of the Charles River/Boston Harbor estuary. Wharves were progressively constructed out from the shore into deeper water. In 1795, the wharf line was at approximately Sta. 14+00 along Cambridge Street and by 1850 the wharf line was at approximately the west end of the north tail track. It is likely that remnant wharf pilings are still buried in the filled portions of Cambridge Street. There could also be other obstructions buried in this area as part of the progressive process of filling in shallow water areas as the wharves were extended into deeper water.

GEI encountered numerous shallow obstructions when attempting vacuum excavation to clear utilities for its borings. These obstructions consisted of “asphalt and cobblestone roadways, concrete slabs, walls, and footings, and various types of construction debris.” Below a depth of 6 ft, GEI encountered timber piles in their explorations. GZA had to abandon some of its explorations because of utility conflicts and other obstructions.

The orientation of Cambridge Street and the Charles Circle area were different historically than they are currently and there may be extensive remnant foundation structures along the proposed tunnel alignments. In GZA’s 1987 Geotechnical Data Report, Figure 3 shows the historic building locations. This plan, based on the work of Archeological Consultant Beth Powers, shows the approximate location of buildings in 1895 and in 1928 with respect to the orientation of Cambridge Street in 1987.

In 1895, buildings on the north side of Cambridge Street extended out to the center of the current road from about North Grove Street to New Chardon Street. On the south side of Cambridge Street, buildings also extended out into the current street between Hancock and Bowdoin Street and between Grove Street and Charles Circle. The foundation type of these buildings is not known.

There are several buildings along the alignment that have apparently been demolished since 1987. Three to four narrow buildings at the corner of Cambridge Street Avenue and Cambridge Street have been removed. The MBTA Charles Station that existed in 1987 has also been demolished and has been replaced by the current station.

Haley & Aldrich has not identified any structures along the tunnel alignment that have used temporary or permanent tiebacks installed under Cambridge Street. Suffolk University along Cambridge Street (Sta. 25+00) used concrete diaphragm walls to construct a deep basement that extended below the sidewalk along Cambridge Street. Tiebacks are sometimes used with this type of construction, although the excavation could have been entirely internally braced. The existing tail tunnel in Cambridge Street is a short distance away from the foundation of the Suffolk University building and if tiebacks were used, they would have had to been designed in such a way as to avoid the tunnel.

4. GEOTECHNICAL LABORATORY TESTING DATA

Many of the geotechnical engineering reports used as sources of data for this report include some amount of geotechnical laboratory testing. The majority of the data can be found in two reports: the 1987 GZA Geotechnical Data Report and the 2001 GEI Geotechnical/Environmental Report, which are available as part of the information compiled as part of this project.

5. SITE CONDITIONS

Existing foundation information along the proposed alignment is shown on the Subsurface Exploration Location Plan, Figures 2 through 5. The footprints of buildings along the alignment are shaded one of three colors based on the depth within the soil profile where each building derives its support. The foundation depth categories are green for shallow, blue for intermediate, and gray for deep. Foundation type is also noted on the building footprint. Buildings that no longer exist but show up on the base plan are also noted.

Building foundation information comes from a variety of sources. In 1987, GZA researched building department records for foundation information and summarized their finding in their data report on a plan titled “Existing Building Foundation Types.” Haley & Aldrich has incorporated GZA’s information and attempted to update and expand it on Figures 2 through 5.

Color coding was used on Figures 2 through 5 to distinguish whether or not the presented foundation information is from GZA or if it is new information. If foundation information was shown for a building in GZA’s report and Haley & Aldrich has found no further information to warrant modification, the perimeter of the building’s footprint is shown with a dark green line.

Buildings for which new foundation information has been identified have a red line drawn around their perimeters except where noted on the drawing.

5.1 Existing Structures and Foundations along the Tunnel Alignment

5.1.1 Charles Circle Area

The foundations for the existing Longfellow Bridge and elevated MBTA platform are discussed in the 2001 GEI report. In general, these structures are on a combination of deep foundation elements (timber piles, and combination timber and concrete piles) and spread footings.

Red Line Piers 6 and 7 may have shallow or intermediate foundations and will likely need to be underpinned prior to the proposed construction. GEI performed a test pit at the location of Pier 6 and found an oversized pile cap/footing. They were unable to excavate deeper than El. 103. This is the pier that the installation records indicate was not (at least initially) pile supported and that settled 6 in. The pier was apparently underpinned; however, it is not clear if it is pile supported or just has a deep footing. GEI assumed that it is pile supported but the top of the clay is within 5 to 10 ft of El. 103 and it may be a deep footing bearing on the top of the clay. The pile cap/footing extends approximately 5.5 ft out from the base of Pier 6 (refer to the GEI report for more information).

The Storrow Drive on and off ramps are likely on deep foundations but no documents have yet been located to confirm foundation type.

Figure 13 presents information compiled by the BGWT on the foundations of a group of residential buildings to the south of Charles Circle between Storrow Drive and Charles Street. Most of these buildings are on timber piles and top-of-pile/bottom-of-pile-cap information has been compiled, as well as information on which of these building has been underpinned to lower the top of pile elevation. Typically, the timber piles in this area derive their support

within the clay stratum. Buildings not on timber piles in this area are likely on concrete caissons bearing at the top of the clay but building department records simply say “concrete piles.”

A foundation plan for the New Charles/MGH Station is provided in Appendix B. This recently constructed station is supported on 50-ton minipiles deriving their support in the glacial till/and or bedrock.

5.1.2 Liberty Hotel (formerly known as Charles Street Jail) and MGH Yawkey Center for Outpatient Care and Garage

The Charles Street Jail to the north of Charles Circle is on untreated timber piles supported in the upper part of the portion of the marine clay based on the McPhail 2001 Geotechnical Report for the MGH Ambulatory Building and Garage, which is adjacent to the jail.

According to the McPhail report, the MGH Ambulatory Building and Garage required a 70- to 75-ft deep excavation to construct. Concrete diaphragm “slurry” wall construction was used. For groundwater cutoff, McPhail recommended that the perimeter slurry wall extend at least 15 ft below the final excavation level and a minimum of 10 ft below the top of the glacial till deposit, whichever is deeper. Haley & Aldrich designed the concrete diaphragm wall for this project.

Top-down construction methods were used to expedite construction and eliminate the need for external bracing (tiebacks). Caissons or load bearing elements (LBE) installed prior to general excavation to support the interior columns extended into the glacial till (lightly loaded columns) or 20 ft minimum into the moderately weathered bedrock (heavily loaded columns). Use of concrete diaphragm walls also allowed for the maintenance of the existing groundwater table and limited horizontal deflections of the excavation walls and settlement of nearby buildings bearing in the upper clay.

It was assumed in the design that sumping within the excavation would suffice to control groundwater. Piezometric levels below the excavation bottom were to be monitored for excess hydrostatic pressure within the permeable portion of the glacial till deposit to insure that the pressure is adequately reduced by the contractor’s dewatering system. Haley & Aldrich has not heard of any dewatering issues during construction.

The lowest level slab was designed as an underdrained slab-on-grade in conjunction with the perimeter foundation wall acting as a groundwater cutoff. Flow into the underdrain system was estimated to be about 15 gallons per minute (gpm). The drain was designed for 50 gpm, based on the McPhail 2001 report.

5.1.3 Sta. 10+00 to Sta. 13+00

On the south side of Cambridge Street, the 326 Cambridge Street Building is relatively new and appears to be supported on 70-ton minipiles of unknown length and diameter based on the foundation plan prepared by Cowen Associates, dated 7 July 2000. The borings indicate that the marine clay is about 20 ft thick in this area and the minipiles for this building likely derive their support in the glacial till that underlies the clay.

The foundations for the bents supporting the elevated MBTA Red Line tracks between Pier 7 and the Beacon Hill Portal are unknown and may need to be underpinned and/or monitored very closely during construction.

On the north side of Cambridge Street between Sta. 10+00 and Sta. 13+00 are three buildings that are on caissons deriving their support in the top of the clay. Several buildings in this area have apparently been demolished recently because they show up on the base plan but no longer exist. There are two buildings adjacent to Cambridge Street in this area for which the foundations are not known. Given the apparent presence of organic silt in the area, these buildings are likely on caissons or timber piles deriving their support in the upper clay or have basements extending down to the top of the clay.

5.1.4 Charles River Plaza

The Charles River Plaza is a building complex with a two-level below-grade parking structure extending beneath the building complex. The original parking structure and building are supported by an 18-in. mat slab bearing in the top of the marine clay. There is an underdrain system below the mat slab.

There have been several additions/renovations to the original parking structure and building including construction of a multi-level aboveground building along Cambridge Street over the existing underground parking garage structure and along the north side of the parking garage. The aboveground structure along Cambridge Street apparently extends beyond the underground parking structure and its south wall is supported by drilled shafts bearing within the glacial till. The remainder of the structure is supported on spread footings excavated below the original mat foundation of the parking structure.

Immediately to the west of the new multi-story building along Cambridge Street within the Charles River Plaza is the Holiday Inn, which may have been built as part of the same development but Haley & Aldrich has not been able to find any records of its construction or design. This structure may or may not have underground parking.

A one-story structure, an Au-Bon-Pain bakery, was recently constructed between the Cambridge Street sidewalk and the Holiday Inn. This structure is at least partially supported on spread footings bearing in the fill. On the other end of the Charles River Plaza development near Sta. 23+50 is another one-story structure for an ATM, which is supported at least partially on spread footings bearing in the fill.

5.1.5 Suffolk University Building

The Suffolk University Building on the south side of Cambridge Street at about Sta. 25+00 appears to have been constructed using concrete diaphragm “slurry” walls. The lowest level slab-on-grade for this structure is at El. 104.5 and appears to be bearing within the “possible glacial moraine deposits” stratum. The underground footprint for this structure extends out just beyond the Cambridge Street sidewalk. It is not known if internal bracing or tiebacks were used in the construction of this foundation, but at this time we judge internal bracing was probably used.

5.1.6 Other Structures along the Tunnel Alignment

All that is currently known about other existing adjacent foundations along Cambridge Street is as shown on Figures 2 through 5 and Figure 13.

REFERENCES

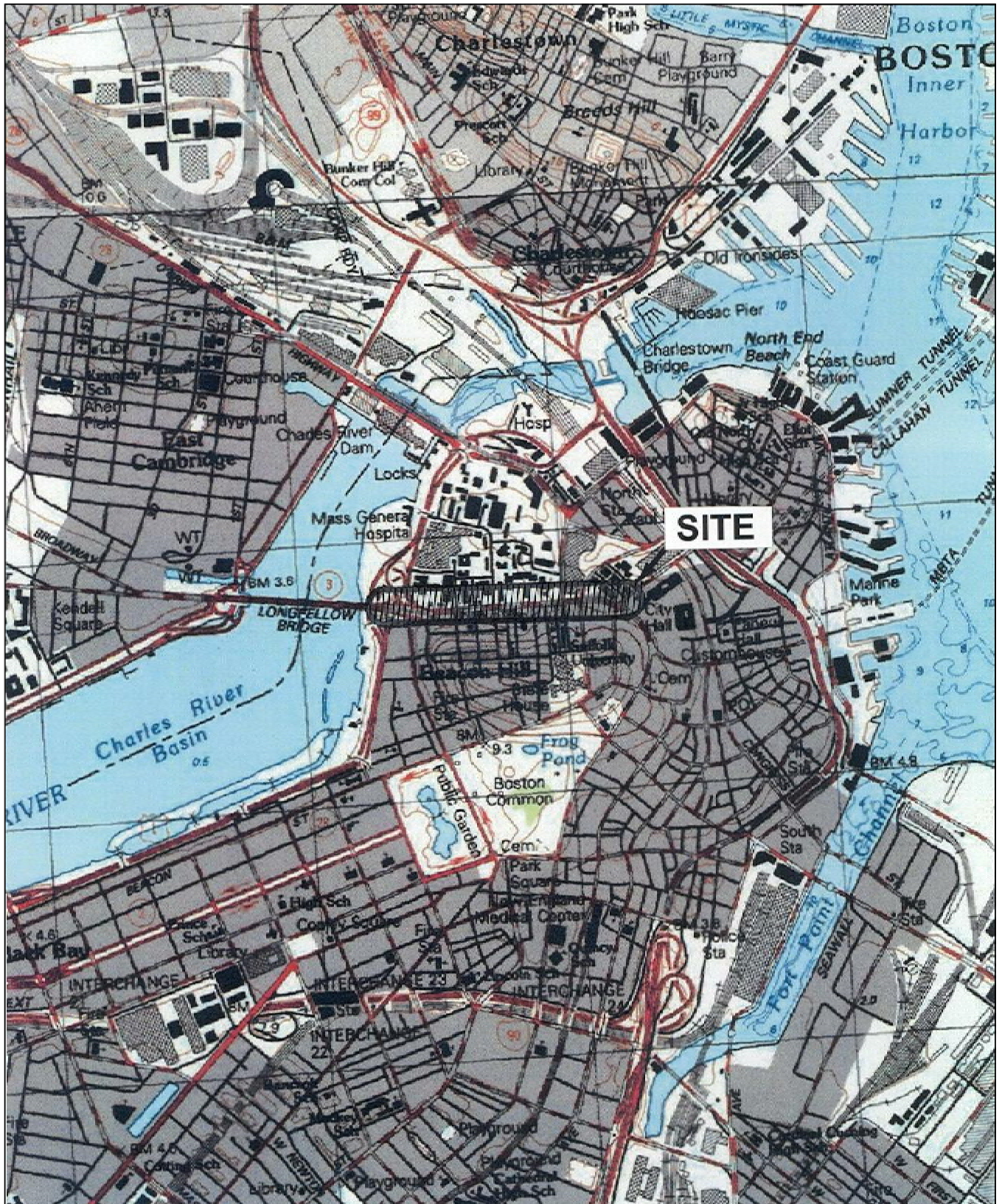
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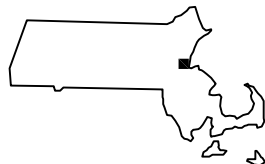
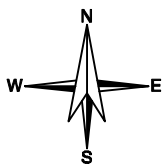
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G:\35151\Reports\2010 0125_HAI_GeoDataRpt_F.doc

FIGURES



SITE COORDINATES: 42°21'40"N 71°36'0"W



U.S.G.S. QUADRANGLE: BOSTON SOUTH, MA

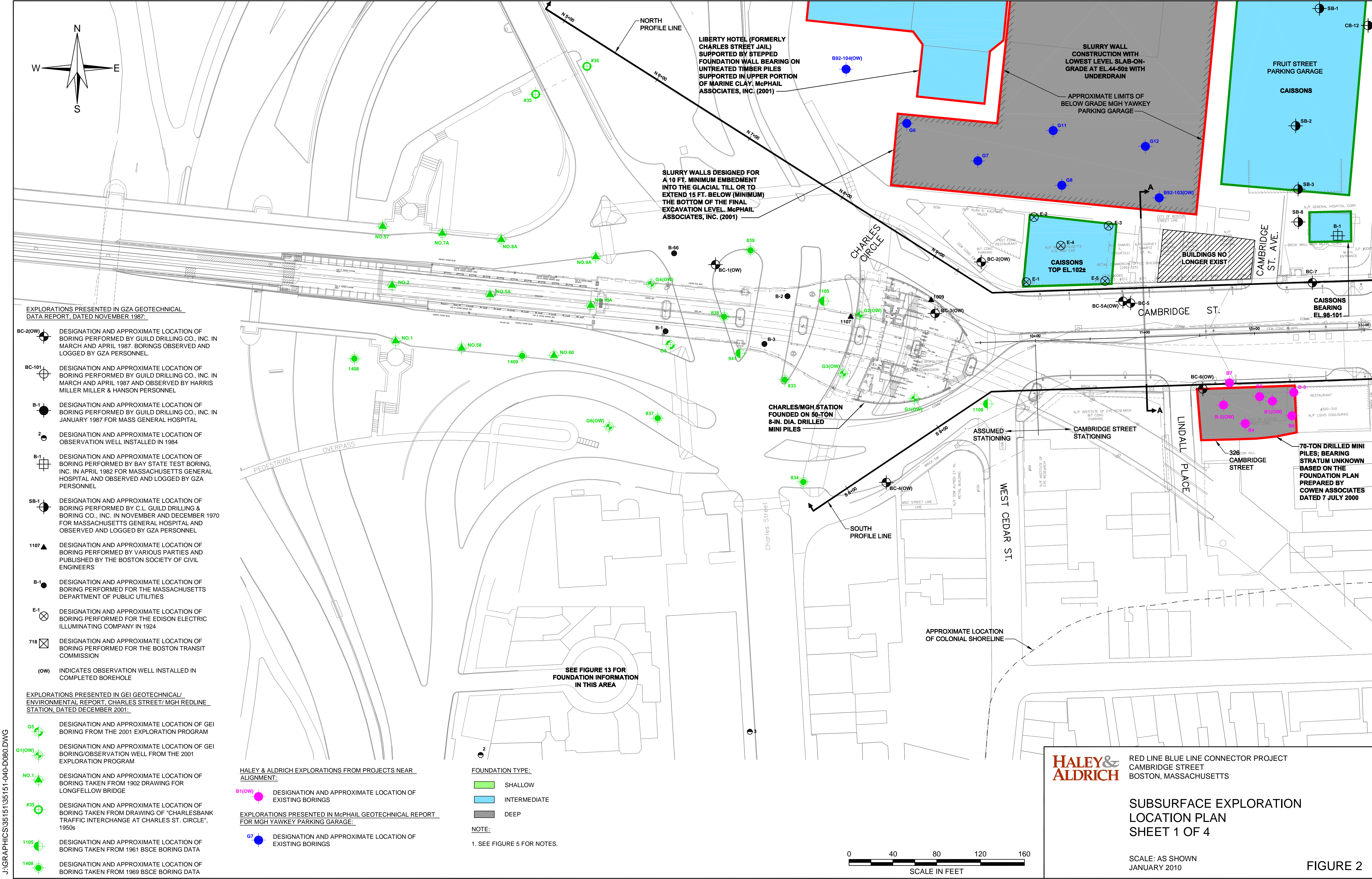
HALEY & ALDRICH

RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

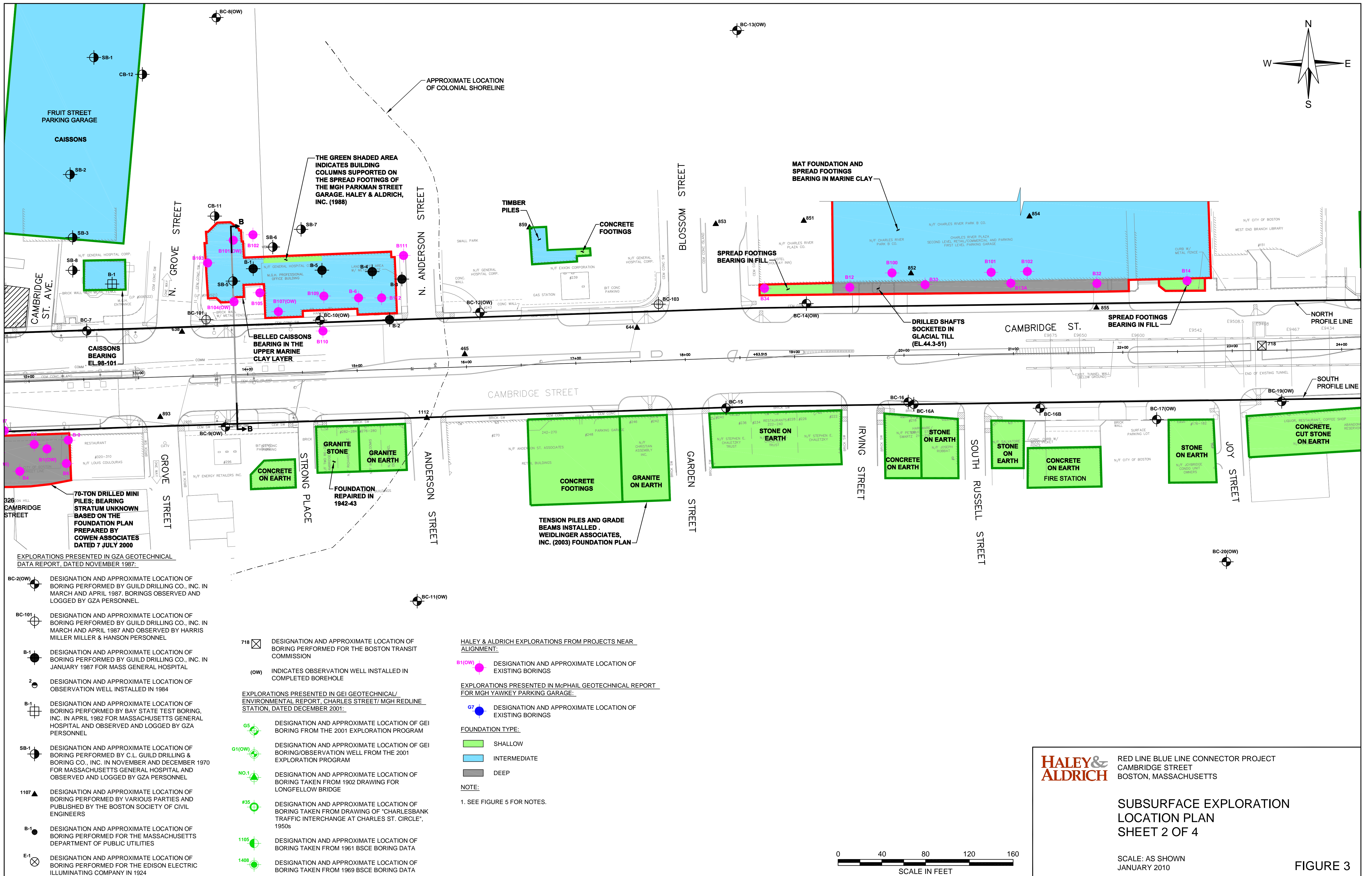
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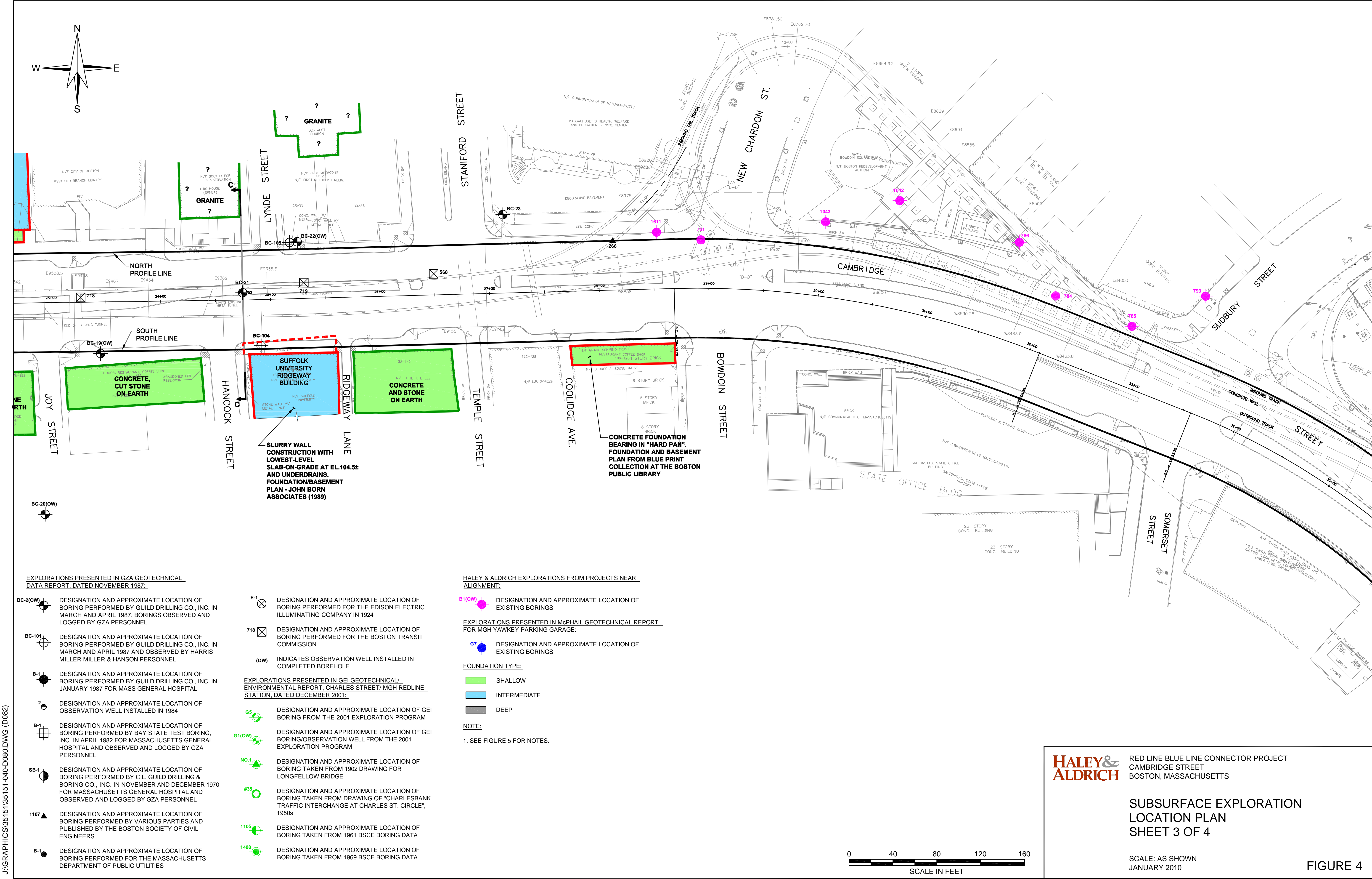
SCALE: AS SHOWN
JANUARY 2010

FIGURE 1



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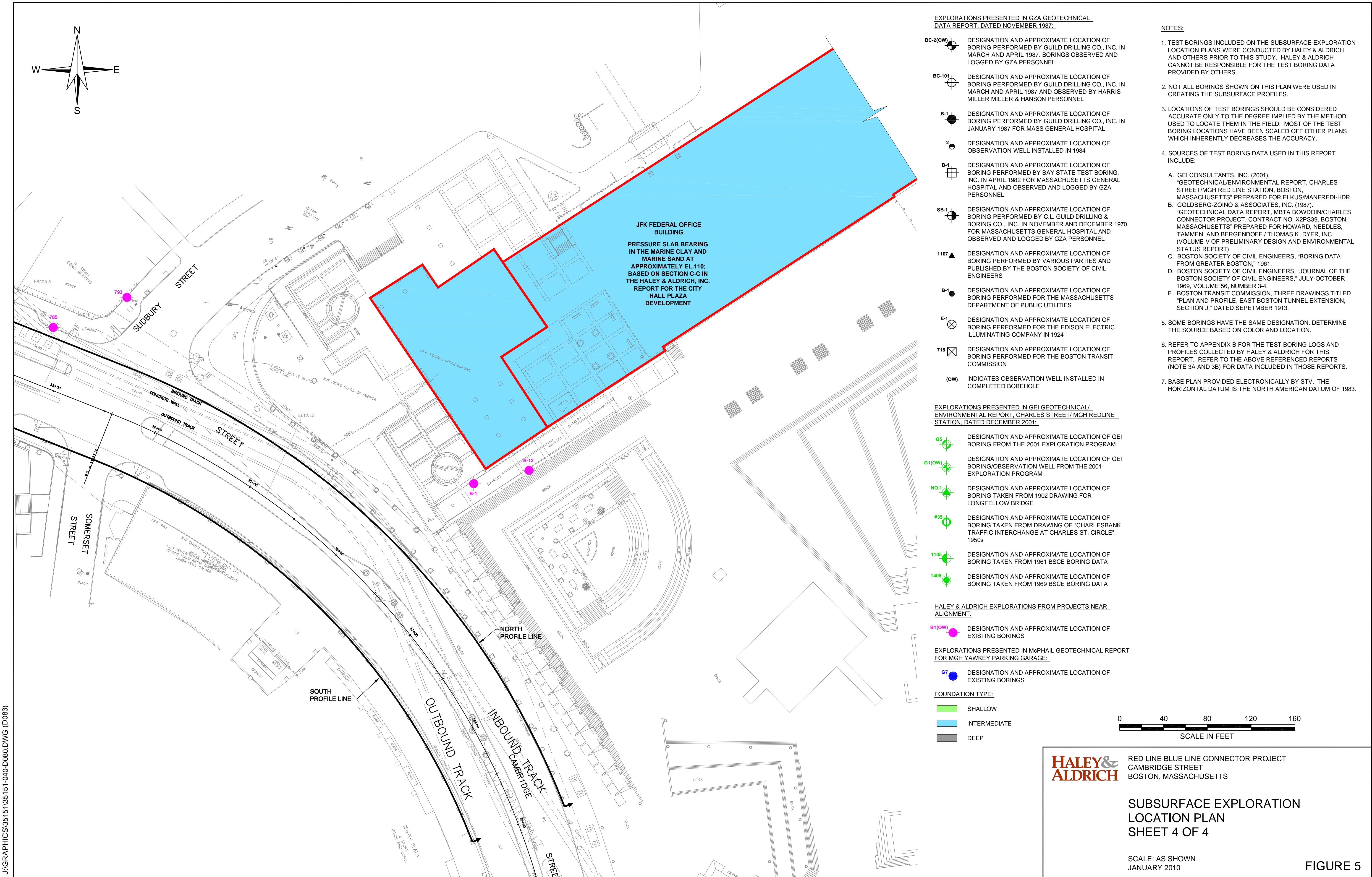
RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

SUBSURFACE EXPLORATION
LOCATION PLAN
SHEET 3 OF 4

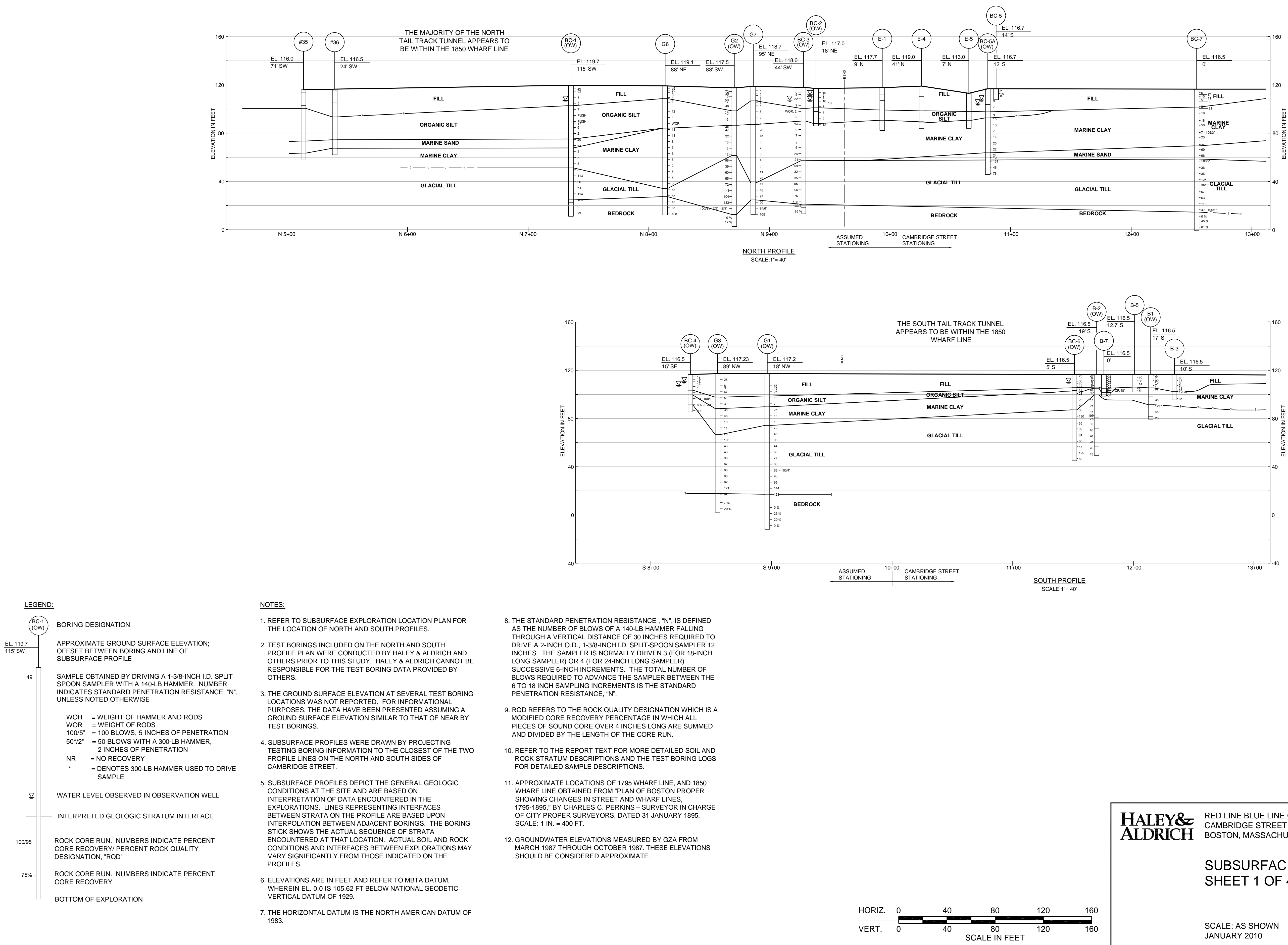
SCALE: AS SHOWN
JANUARY 2010

FIGURE 4

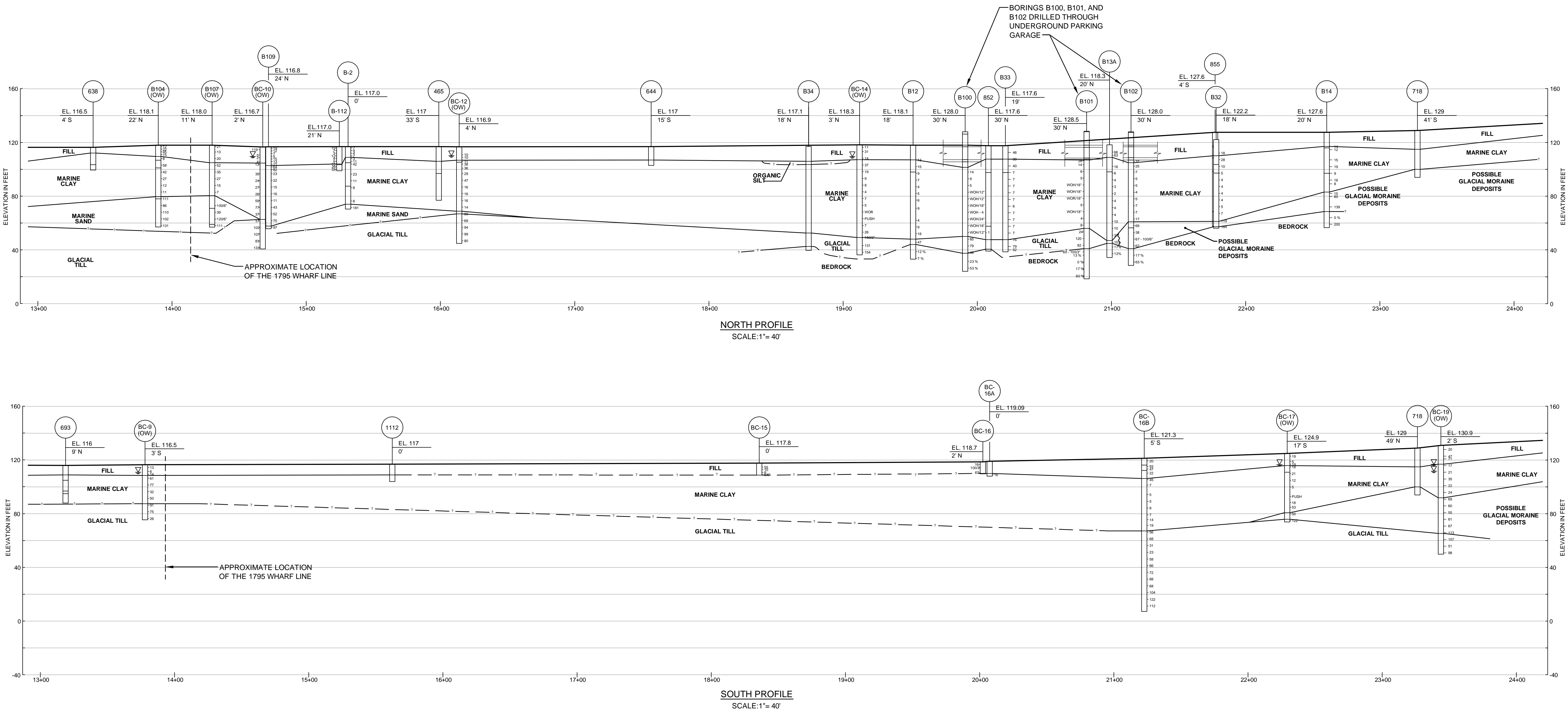
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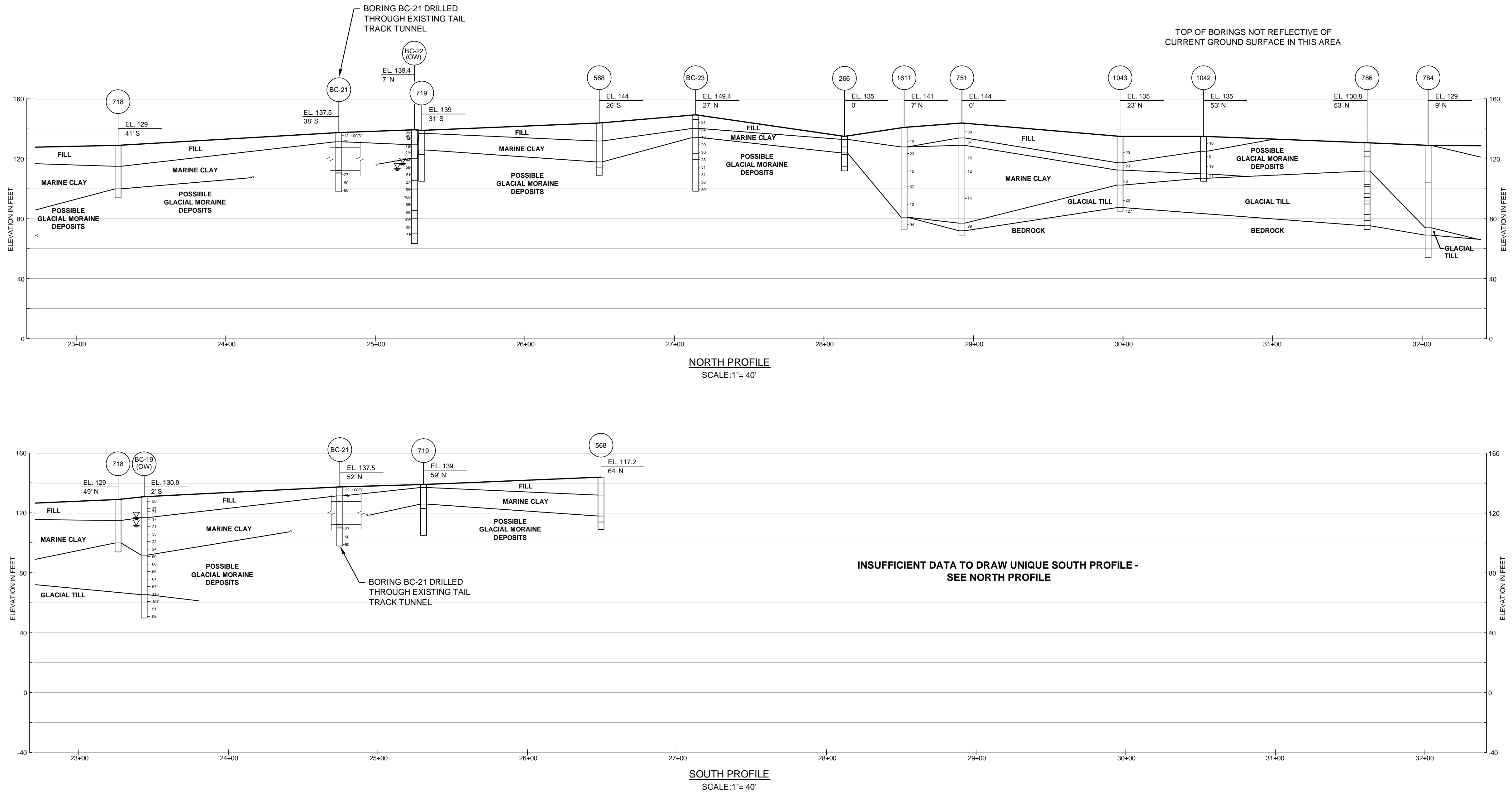
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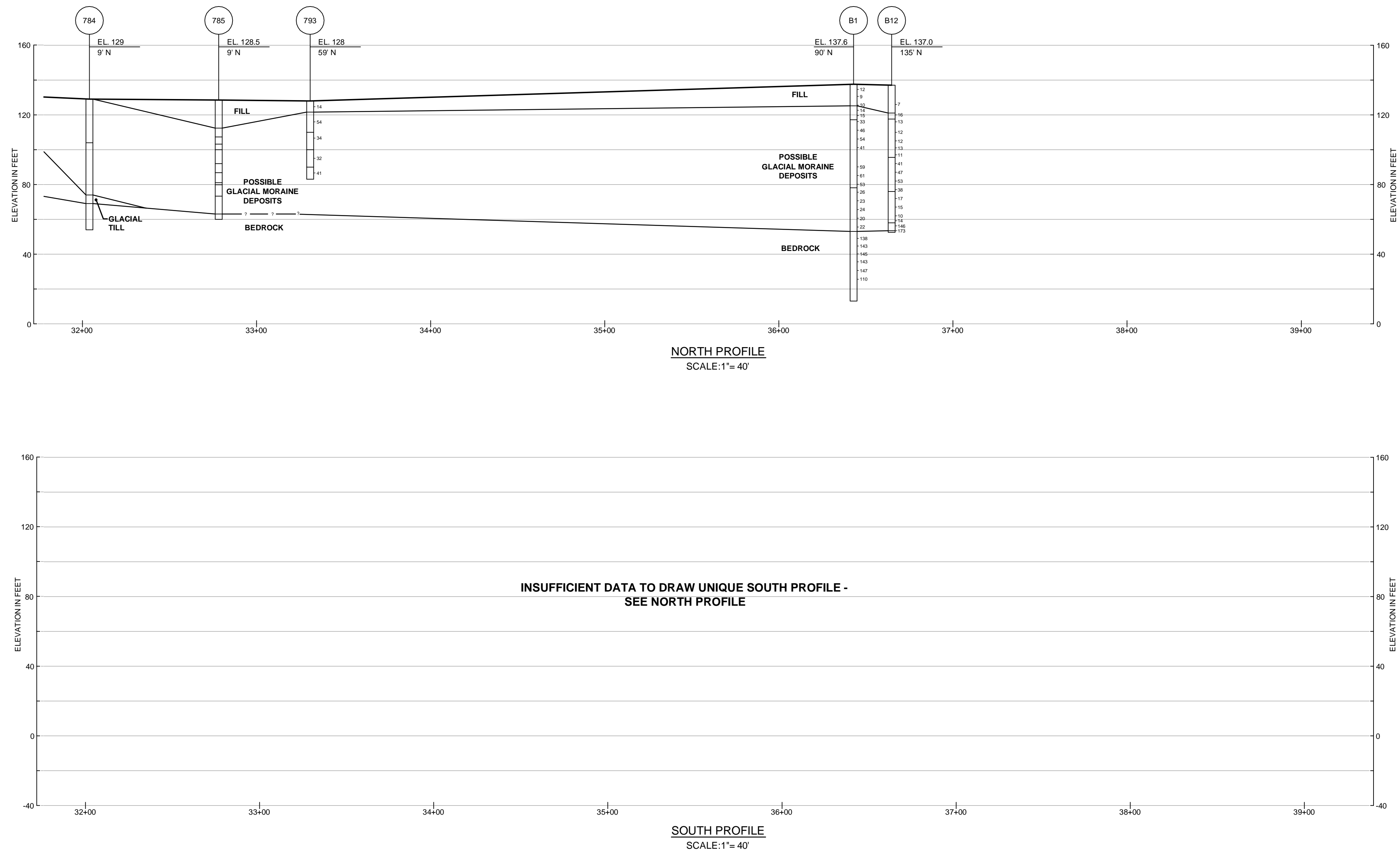
HALEY & ALDRICH RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

**SUBSURFACE PROFILES
SHEET 3 OF 4**

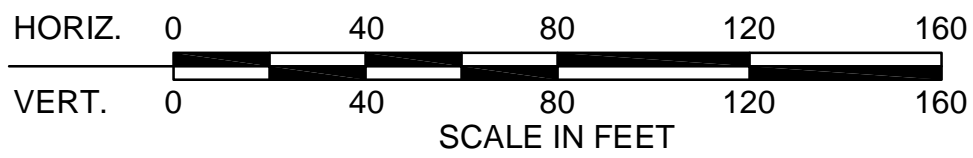
SCALE: AS SHOWN
JANUARY 2010

FIGURE 8

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NOTE:
1. REFER TO FIGURE 6 FOR LEGEND AND NOTES.

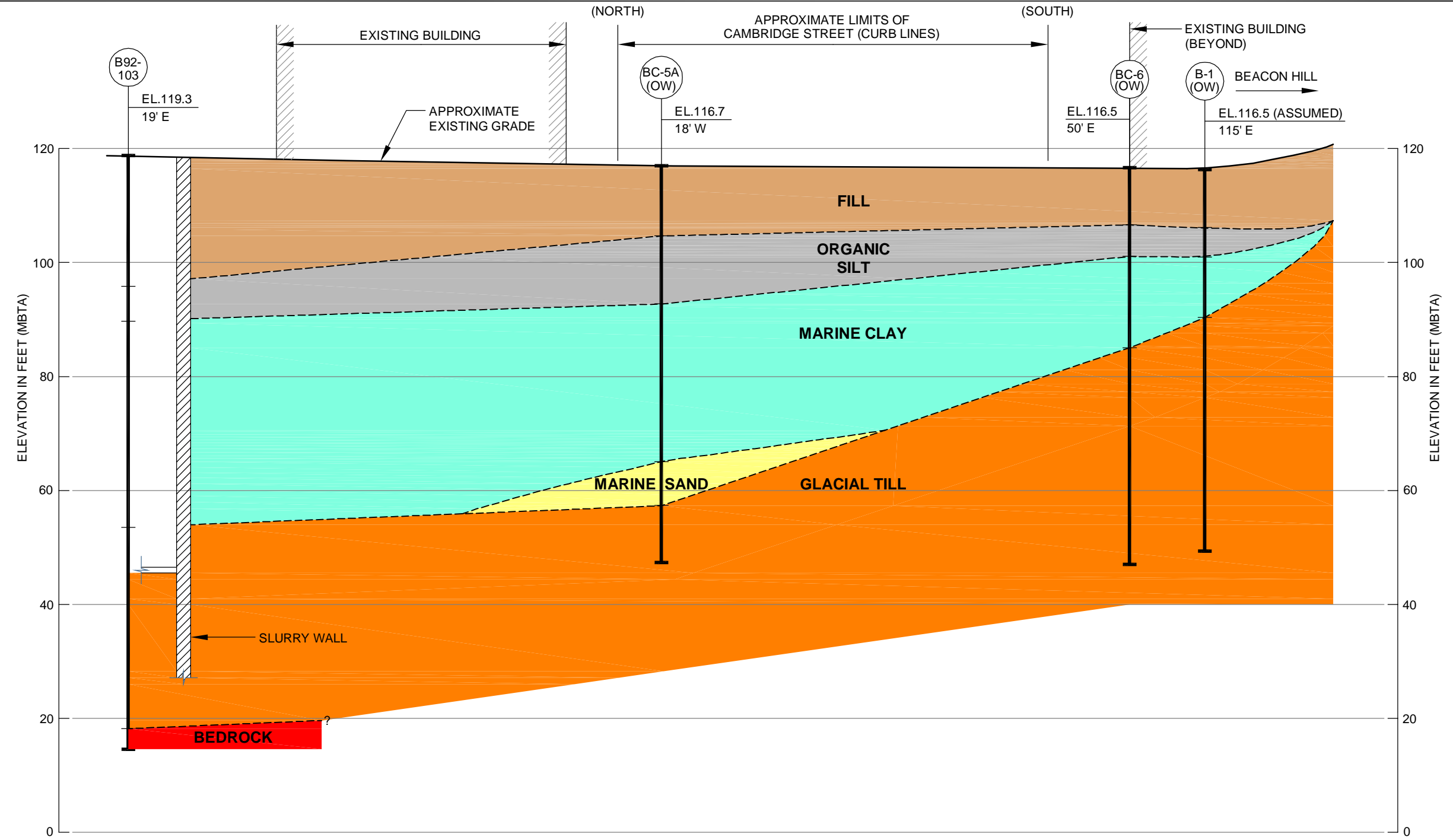


HALEY & ALDRICH RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

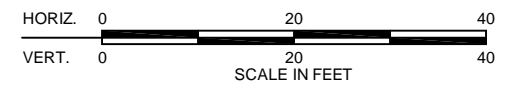
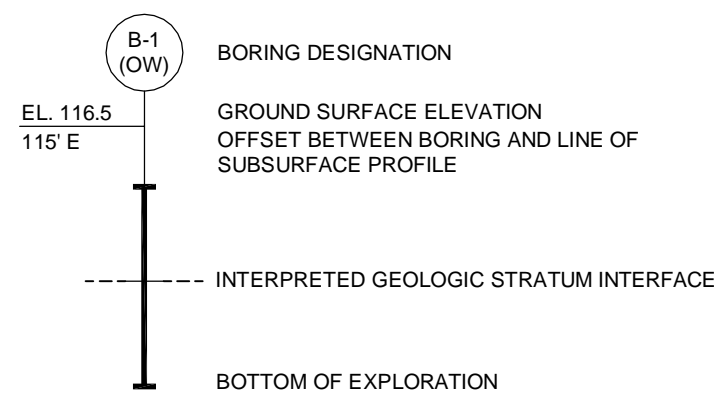
SUBSURFACE PROFILES
SHEET 4 OF 4

SCALE: AS SHOWN
JANUARY 2010

FIGURE 9



LEGEND:

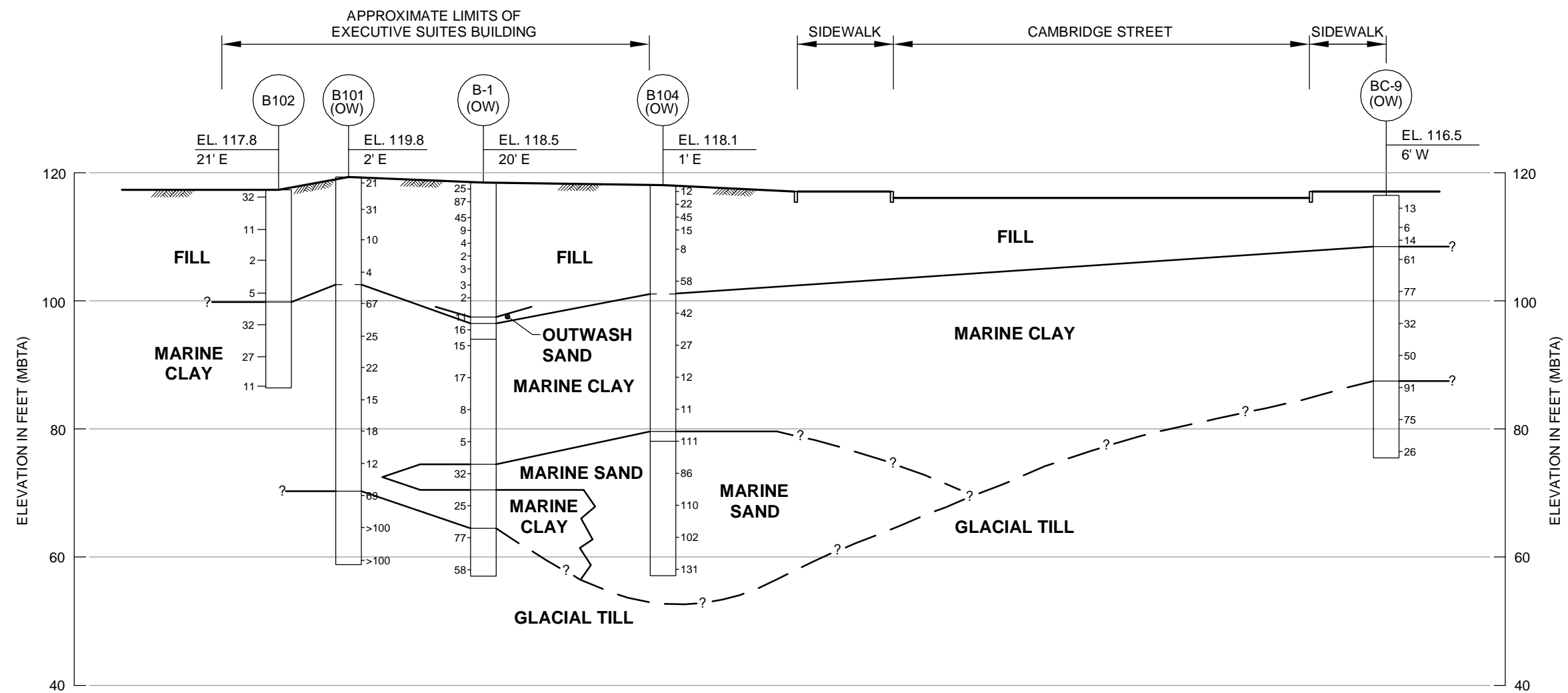


HALEY & ALDRICH RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

SECTION A-A AT STA. 11+00

SCALE: AS SHOWN
JANUARY 2010

FIGURE 10



LEGEND:

- B102 BORING DESIGNATION
- EL. 117.8
21' E
— GROUND SURFACE ELEVATION
— OFFSET BETWEEN BORING AND LINE OF
— SUBSURFACE PROFILE
- 32
— SAMPLE OBTAINED BY DRIVING A
— 1-3/8-INCH I.D. SPLIT SPOON SAMPLER
— WITH A 140-LB HAMMER. NUMBER INDICATES
— STANDARD PENETRATION RESISTANCE "N",
— UNLESS NOTED OTHERWISE
- INTERPRETED GEOLOGIC STRATUM INTERFACE
- BOTTOM OF EXPLORATION



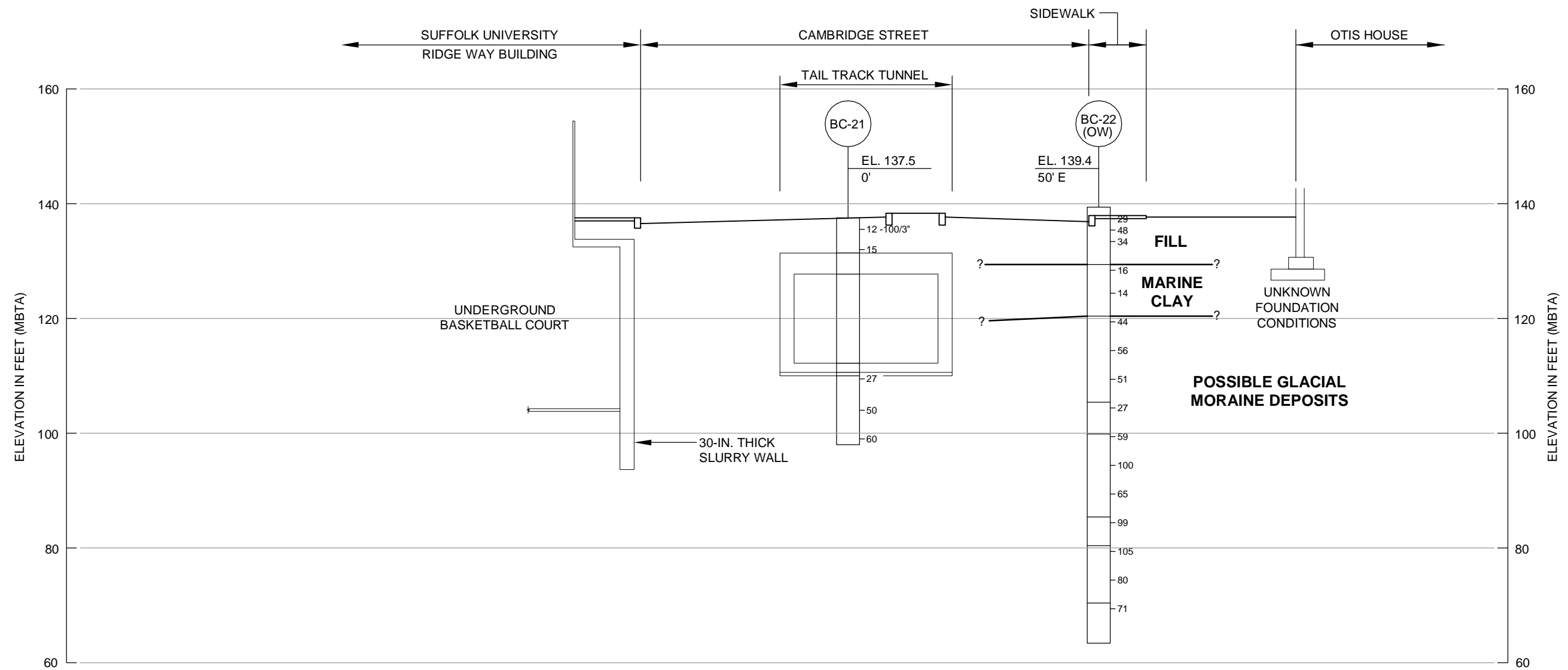
HALEY & ALDRICH RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

SECTION B-B AT STA. 13+89

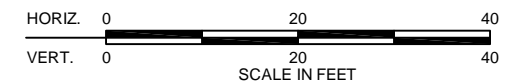
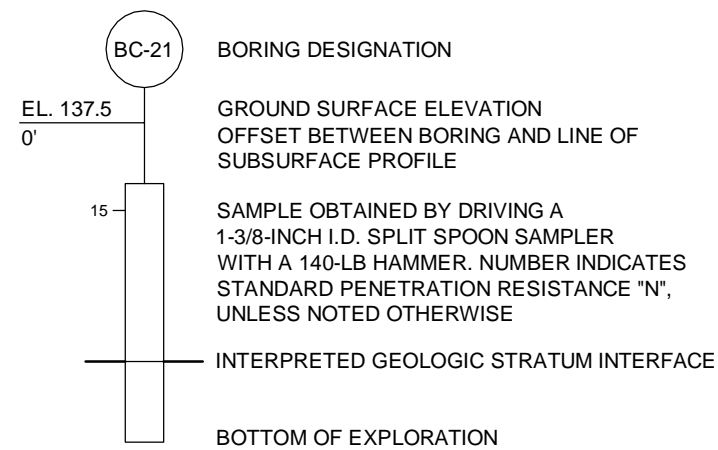
SCALE: AS SHOWN
JANUARY 2010

FIGURE 11

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LEGEND:



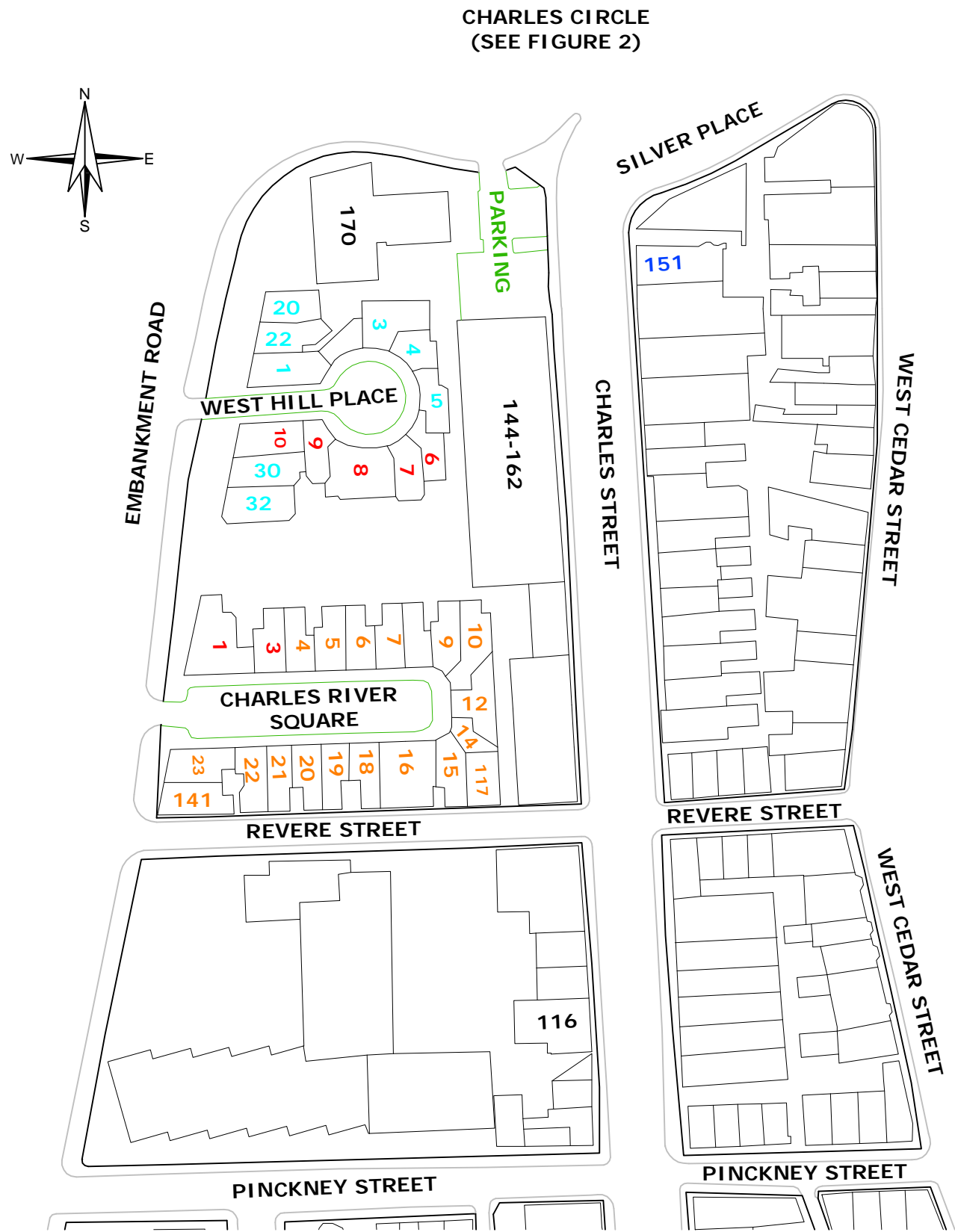
HALEY & ALDRICH RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

SECTION C-C AT STA. 24+75

SCALE: AS SHOWN
JANUARY 2010

FIGURE 12

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FOUNDATION KEY:

| | |
|-------------------|------------------------|
| RED NUMBER | BUILDING UNDERPINNED |
| GREEN NUMBER | CUTOFF ELEV. < 104 |
| BLUE NUMBER | CUTOFF ELEV. = 104-105 |
| ORANGE NUMBER | CUTOFF ELEV. = 105-106 |
| LIGHT BLUE NUMBER | CUTOFF ELEV. = 106-107 |
| BLACK NUMBER | CONCRETE PILES |

NOTES:

1. BASE PLAN TAKEN FROM DRAWING TITLED "BOSTON GROUNDWATER TRUST (BGwT): INSPECTIONAL SERVICES DEPARTMENT (ISD); 2009 FOUNDATION DATA FOR LOWER BEACON HILL" PREPARED BY BOSTON GROUNDWATER TRUST (BGwT), DATED 18 JUNE 2009.
2. THE COLOR-CODED CUTOFF ELEVATIONS PROVIDED ARE FOR THE TIMBER PILES SUPPORTING THE STRUCTURE AT THE STREET ADDRESS.
3. THE NUMBER PROVIDED IN THE PROPERTY IS THE STREET NUMBER.
4. THE TERM "CONCRETE PILES" USED ABOVE IS NONSPECIFIC IN IDS RECORDS AND COULD INCLUDE DRIVEN CONCRETE PILES AND CAISSONS.
5. ELEVATIONS SHOWN ARE BASED ON MBTA DATUM. BGwT TYPICALLY REPORTS ELEVATION USING BCB DATUM WHICH IS 100 FT. HIGHER THAN MBTA DATUM.

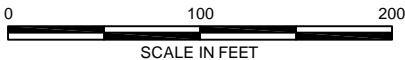
BOSTON GROUNDWATER TRUST

Building Data: Inspectional Services Department (ISD)
Foundation Data

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The ISD Foundation Data and information accessible on this website is provided "as is", and there may be omissions or inaccuracies in such information and data. The information contained in the ISD Foundation Data should only be used for reference and not as a definitive measuring guide for wood pile cut-off elevations or underpinning information. The Boston Groundwater Trust (BGwT), its affiliates, agents and information providers cannot and do not guarantee the accuracy, sequence, completeness, or fitness for a particular purpose of the information or data made available through this website.

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HALEY &
ALDRICH

RED LINE BLUE LINE CONNECTOR PROJECT
CAMBRIDGE STREET
BOSTON, MASSACHUSETTS

BOSTON GROUNDWATER TRUST
FOUNDATION PLAN -
CHARLES CIRCLE AREA

SCALE: AS SHOWN
JANUARY 2010

APPENDIX A

Boring Logs from Previous Subsurface Exploration Programs:

MGH Yawkey Center for Outpatient Care

326 Cambridge Street

MGH Professional Office Building

Charles River Plaza

Appendix does not include explorations previously presented in the following two reports:

GEI Consultants, Inc. (2001). “Geotechnical/Environmental Report, Charles Street/MGH Red Line Station, Boston, Massachusetts,” prepared for Elkus/Manfredi-HDR

Goldberg-Zoino & Associates, Inc. (1987). “Geotechnical Data Report, MBTA Bowdoin/Charles Connector Project, Contract No. X2PS39, Boston, Massachusetts,” prepared for Howard Needles, Tammen, and Bergendoff / Tomas K. Dyer, Inc. (Volume V of Preliminary Design and Environmental Status Report)

MGH Yawkey Center for Outpatient Care

B92-103

DATUM BOSTON CITY BASE DATE 11/4/92-
11/5/92
BORING METHOD CASED WASHED

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|--------------------|--|-------------|---------|------|-----------|-----------------|--|------------------------|--------------------------------------|
| ELEVATION DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | | |
| +19.3 | GROUND SURFACE | | | | | +20.0 | | | |
| 0.0 | ASPHALT | | | | | | | | |
| +19.0 | | | 1 | | 20 | | | | |
| 0.3 | | | | | | | | | |
| | Loose dark brown GRAVELLY SAND Some silt containing ashes and cinders (FILL) | | 2 | | 9 | +15.0 | | | |
| | | | 3 | | 3 | +10.0 | | | |
| | | | 4 | | 20 | +5.0 | | | |
| | | | 5 | | 3 | | | | |
| | | | 6 | | 2 | 0.0 | | | |
| | | | 7 | | 6 | | | | |
| -2.7 | | | | | | | | | |
| 22.0 | Firm brown organic SILT and fine SAND | | 8 | | 4 | -5.0 | | | |
| | | | | | | | | | |
| -8.7 | Stiff gray silty CLAY with occasional lenses of medium sand and gravel | | 9 | | 24 | -10.0 | | | |
| 28.0 | | | 10 | | 15 | -15.0 | | | |
| | | | | | | | | | |
| -19.7 | | | | | | -20.0 | | | |
| 39.0 | | | | | | | | | |
| | Continued on sheet 2 of 3 | | | | | | | | |
| REMARKS | | | | | | | | | |

RECORD OF BOREHOLE

SHEET 2 OF 3

LOCATION SEE FIG. 2

B92-103

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

DATUM BOSTON CITY BASE DATE 11/4/92-11/5/92

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | | | | | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|--------------------|---|-------------|---------|------|-----------|--------------------|--|--|--|--|---------------------------|---|
| ELEVATION DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | | | | | |
| | Continued from sheet 1 of 3 | | | | | | | | | | | |
| -19.7 39.0 | | | 11 | | 7 | -20.0 | | | | | | |
| | | | 12 | | 7 | -25.0 | | | | | | |
| | Stiff gray silty CLAY with occasional lenses of medium sand and gravel | | 13 | | 25 | -30.0 | | | | | | |
| | | | 14 | | 20 | -35.0 | | | | | | |
| | | | 15 | | 14 | -40.0 | | | | | | |
| -44.7 64.0 | | | 16 | | 111 | -45.0 | | | | | | |
| | Very dense mixture of SILT, SAND and GRAVEL containing cobbles and boulders (GLACIAL TILL) | | 17 | | 54 | -50.0 | | | | | | |
| | | | 18 | | 141/9" | -55.0 | | | | | | |
| -60.7 80.0 | | | | | | -60.0 | | | | | | |
| | Continued on sheet 3 of 3 | | | | | | | | | | | |

REMARKS

VERTICAL SCALE
1 IN. TO 4 FT.



McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN JSM
CHECKED RCH

RECORD OF BOREHOLE

SHEET 3 OF 3

B92-103

LOCATION SEE FIG. 2

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

DATUM BOSTON CITY BASE DATE 11/4/92-
11/5/92

BORING METHOD CASED WASHED

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | | | | | | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|--------------------|---|-------------|---------|------|-----------|--------------------|--|--|--|--|--|---------------------------|---|
| ELEVATION DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | | | | | | |
| | Continued from sheet 2 of 3 | | | | | | | | | | | | |
| -60.7 80.0 | | | 19 | | 56 | -60.0 | | | | | | | |
| | | | 20 | | 79 | -65.0 | | | | | | | |
| | Very dense gray well-graded mixture of SILT, SAND and GRAVEL containing cobbles and boulders (GLACIAL TILL) | | 21 | | 73 | -70.0 | | | | | | | |
| | | | 22 | | 118 | -75.0 | | | | | | | |
| -79.7 99.0 | | | 23 | | | -80.0 | | | | | | | |
| | Soft, severely weathered extremely fractured GRAY ARGILLITE | | 24 | | | -85.0 | | | | | | | |
| -84.6 103.9 | | | | | | | | | | | | | |
| | BOTTOM OF BOREHOLE | | | | | | | | | | | | |

REMARKS Groundwater observation well installed to a depth of 16.1 feet immediately adjacent to completed borehole B-103.
See groundwater monitoring report for readings.

VERTICAL SCALE
1 IN. TO 4 FT.



McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN JSM
CHECKED RCH

RECORD OF BOREHOLE

B92-104

SHEET 1 OF 3

LOCATION SEE FIG. 2

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

DATUM BOSTON CITY BASE DATE 11/5/92-11/7/92

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|--------------------|--|-------------|---------|------|-----------|-----------------|------------------------|--------------------------------------|
| ELEVATION DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | |
| +17.8 | GROUND SURFACE | | | | | +20.0 | | |
| 0.0 | ASPHALT | | 1 | | 36 | +15.0 | | |
| +17.5 | | | 2 | | 5 | +10.0 | | |
| 0.3 | | | 3 | | 3 | +5.0 | | |
| | Loose dark brown GRAVELLY SAND, some silt containing ashes and cinders (FILL) | | 4 | | 2 | 0.0 | | |
| -1.2 | | | 5 | | 8 | -5.0 | | |
| 19.0 | | | 6 | | 9 | -10.0 | | |
| | Firm brown organic fine SAND and SILT | | 7 | | 7 | -15.0 | | |
| | | | 8 | | 1 | -20.0 | | |
| -21.2 | | | | | | | | |
| 39.0 | | | | | | | | |
| | Continued on sheet 2 of 3 | | | | | | | |
| REMARKS | | | | | | | | |

VERTICAL SCALE
1 IN. TO 4 FT.



McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN JSM
CHECKED RCH

RECORD OF BOREHOLE

B92-104

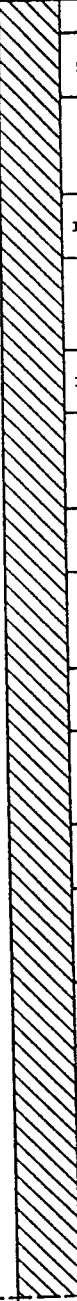
SHEET 2 OF 3

LOCATION SEE FIG. 2

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

DATUM BOSTON CITY BASE DATE 11/5/92-
11/7/92

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | | | | | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|-----------------|--|--|---------|------|-----------|--------------------|--|--|--|--|---------------------------|---|
| ELEV N DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | | | | | |
| | Continued from sheet 1 of 3 | | | | | -20.0 | | | | | | |
| -21.2 39.0 | Stiff gray silty CLAY with occasional lenses of medium sand and gravel |  | 9 | | 43 | -25.0 | | | | | | |
| | | | 10 | | 22 | -30.0 | | | | | | |
| | | | 11 | | 9 | -35.0 | | | | | | |
| | | | 12 | | 8 | -40.0 | | | | | | |
| | | | 13 | | 7 | -45.0 | | | | | | |
| | | | 14 | | 8 | -50.0 | | | | | | |
| | | | 15 | | 11 | -55.0 | | | | | | |
| | | | 16 | | 6 | -60.0 | | | | | | |
| -62.2 80.0 | Continued on sheet 3 of 3 | | | | | | | | | | | |
| REMARKS | | | | | | | | | | | | |

VERTICAL SCALE
1 IN. TO 4 FT.



McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN - JSM
CHECKED - RCH

RECORD OF BOREHOLE

SHEET 3 OF 3



B92-104

LOCATION SEE FIG. 2

SAMPLER HAMMER WT. 140 LB. DROP 30 IN.

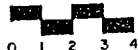
DATUM BOSTON CITY BASE DATE 11/5/92-
11/7/92

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | SAMPLES | | | ELEVATION SCALE | | | | | | ADDITIONAL LAB TESTING | PIEZOMETER OR STANDPIPE INSTALLATION |
|-----------------|--|--|---------|------|-----------|--------------------|--|--|--|--|--|---------------------------|---|
| ELEV N DEPTH | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS FT. | | | | | | | | |
| | Continued from sheet 2 of 3 | | | | | -60.0 | | | | | | | |
| -62.2 80.0 | Stiff gray silty CLAY with occasional lenses of medium sand and gravel |  | 17 | | 20 | -65.0 | | | | | | | |
| -65.7 83.5 | | | 18 | | 39 | -70.0 | | | | | | | |
| | Very dense gray well-graded mixture of SILT, SAND, and GRAVEL containing cobbles and boulders (GLACIAL TILL) |  | 19 | | 63 | -75.0 | | | | | | | |
| | | | 20 | | 33 | -80.0 | | | | | | | |
| -83.5 101.3 | | | 21 | | 231/10" | -85.0 | | | | | | | |
| | BOTTOM OF BOREHOLE | | | | | | | | | | | | |

REMARKS Groundwater observation well installed to a depth of 17.3 feet immediately adjacent to completed borehole B-104.
See groundwater monitoring report for readings.

VERTICAL SCALE
1 IN. TO 4 FT.






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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-6

SHEET 1 of 3
DATE: 1/30/01-1/31/01
DATUM BOSTON CITY BASE
BORING METHOD CASSED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|---|---------|------|------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 0 | 0 | Ground Surface | | | | | | | | |
| | 19.1 | Asphalt | | | | | | | | |
| | | Very loose to loose brown/gray, sand, some gravel, trace to some silt with ash and cinder. (Fill) |  | 1 | SS | 34-36-10-9 | 20" | | | |
| | | | | 2 | SS | 7-6-4-4 | 18" | | | |
| 5 | | | | 3 | SS | 2-2-3-3 | 14" | | | |
| | | | | 4 | SS | 3-3-3-4 | 16" | | | |
| | | | | 5 | SS | 2-2-2-2 | 15" | | | |
| 10 | 10.5 | Very loose to loose, gray/brown, peat and organic silt and fine sand to organic silt and fine sand with shells and peat fibers. (Organic Deposit) |  | 6 | SS | 1-2-2-2 | 20" | | | |
| | 8.58 | | | 7 | SS | 1-2-2-2 | 24" | | | |
| | | | | | | | | | | |
| 15 | | | | | | | | | | |
| | | | | 8 | SS | 4-5-7-4 | 18" | | | |
| 20 | | | | | | | | | | |
| | | | | 9 | SS | 1-2-2-2 | 2" | | | |
| | | | | | | | | | | |
| 30 | | | | 10 | SS | WOR | 17" | | | |
| | | | | | | | | | | |
| 35 | 35 | Stiff, mottled gray and yellow, silty clay. (Marine Deposit) |  | 11 | SS | 5-5-8-11 | 14" | | | |
| | -15.9 | | | | | | | | | |
| 40 | | Continued on sheet 2 of 3 | | | | | | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT. 140 LB. DROP 30 IN.



RECORD OF BOREHOLE G-6

SHEET 2 of 3

DATE: 1/30/01-1/31/01

DATUM BOSTON CITY BASE

BORING METHOD CASSED WASHED




| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | | |
|---------------------------|----------------|--|--|---------|------|------------|-------------------|---|----------------------------|---------|-----|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | | |
| | | Soft to stiff, gray, silty clay. (Marine Deposit) |  | 12 | SS | 5-6-7-9 | 12" | | | | |
| | | | | | | | | | | | |
| 45 | | | | | | 13 | SS | | | 3-3-5-6 | 24" |
| | | | | | | | | | | | |
| 50 | | | | | | 14 | SS | | | 1-2-3-3 | 24" |
| | | | | | | | | | | | |
| 55 | | | | | | 15 | SS | | | 2-2-4-4 | 24" |
| | | | | | | | | | | | |
| 60 | | | | | | 16 | SS | | | 1-2-3-4 | 24" |
| | | | | | | | | | | | |
| 65 | | | | 17 | SS | 1-1-1-2 | 24" | | | | |
| | | | | | | | | | | | |
| 70 | | | | 18 | SS | 1-2-3-3 | 24" | | | | |
| | | | | | | | | | | | |
| 75 | 75 -55.9 | Firm, gray, silty clay, trace gravel and silt. (Marine Deposit) |  | 19 | SS | 1-2-4-4 | 24" | | | | |
| | | | | | | | | | | | |
| 80 | | | | | | | | | | | |
| Continued on sheet 3 of 3 | | | | | | | | | | | |

REMARKS

MGH PARKING FACILITY
 BOSTON, MASSACHUSETTS
 LOCATION SEE FIG.2
 SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-6

SHEET 3 of 3
 DATE: 1/30/01-1/31/01
 DATUM BOSTON CITY BASE
 BORING METHOD CASSED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|--|---------|------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 85 | 85 -65.9 | Very stiff, gray, silty clay, trace to some sand and gravel. (Marine Deposit) |  | 20 | SS | 6-8-12-13 | 12" | | | |
| 85 | | | | | | | | | | |
| 90 | 91.8 -72.7 | Dense to very dense, gray, gravelly sandy silt, some clay to sandy gravelly clay and silt. (Glacial Till) |  | 21 | SS | 9-24-24-27 | 22" | | | |
| 90 | | | | | | | | | | |
| 95 | | | | 22 | SS | 19-25-40-62 | 12" | | | |
| 95 | | | | | | | | | | |
| 100 | | | | 23 | SS | 27-20-23-31 | 22" | | | |
| 100 | | | | | | | | | | |
| 105 | | | | 24 | SS | 12-15-20-23 | 18" | | | |
| 105 | | | | | | | | | | |
| 107 | 107 -87.9 | Very soft, gray, severely Weathered Cambridge Argillite. |  | 25 | SS | 24-34-74-52 | 18" | | | |
| 107 | | | | | | | | | | |
| 110 | | End of Borehole @ 107 Ft. | | | | | | | | |
| 110 | | | | | | | | | | |
| 115 | | | | | | | | | | |
| 120 | | | | | | | | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-7

SHEET 1 of 3

DATE: 1/29/01-1/30/01

DATUM BOSTON CITY BASE

BORING METHOD CASSED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|-------------|---------|------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 0 | 0 | Ground Surface | | | | | | | | |
| | 18.7 | Asphalt | | | | | | | | |
| | | Loose to very dense brown/black sand, some gravel, trace silt with ash and cinder. (Fill) | | 1 | SS | 46-35-40-31 | 18" | | | |
| | | | | 2 | SS | 3-3-3-3 | 16" | | | |
| 4.5 | | | | | | | | | | |
| 5 | 14.2 | Very loose to loose, gray and brown, silty sand, some gravel to silt and sand, trace gravel with brick, ash and cinder. (Fill) | | 3 | SS | 1-1-1-2 | 18" | | | |
| | | | | 4 | SS | 1-2-2-3 | 14" | | | |
| | | | | 5 | SS | 1-2-2-3 | 2" | | | |
| | | | | 6 | SS | 3-2-1-1 | 2" | | | |
| 12 | | | | | | | | | | |
| | 6.66 | Very loose to loose, gray/brown, peat and organic silt, trace sand, trace gravel to organic silt and fine sand with occasional shells and peat fibers. (Organic Deposit) | | 7 | SS | 1-2-2-4 | 18" | | | |
| 15 | | | | 8 | SS | 2-1-1-2 | 12" | | | |
| | | | | | | | | | | |
| | | | | 9 | SS | 3-2-3-2 | 18" | | | |
| 20 | | | | | | | | | | |
| | | | | 10 | SS | 2-1-1-1 | 24" | | | |
| | | | | | | | | | | |
| 30 | | | | 11 | SS | 1-2-2-5 | 22" | | | |
| | 31.5 | | | | | | | | | |
| | -12.8 | Very stiff, mottled yellow and gray, silty clay with trace gravel. (Marine Deposit) | | | | | | | | |
| 35 | | | | 12 | SS | 6-8-12-13 | 20" | | | |
| | | | | | | | | | | |
| 40 | | Continued on sheet 2 of 3 | | | | | | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS

LOCATION SEE FIG.2

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-7

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | | | | |
|---------------------------|---------------|--|-------------|---------|------|------------|-------------------|---|----------------------------|--|---------|-----|--|
| DEPTH | DEPTH ELEV | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | | | | |
| | | Firm to very stiff, gray, silty clay, trace sand and gravel. (Marine Deposit) | | 13 | SS | 4-6-9-9 | 24" | | | | | | |
| | | | | | | | | | | | | | |
| 45 | | | | | | 14 | SS | | | | 2-2-3-3 | 14" | |
| | | | | | | | | | | | | | |
| 50 | | | | | | 15 | SS | | | | 3-3-4-4 | 24" | |
| | | | | | | | | | | | | | |
| 55 | | | | | | 16 | SS | | | | 1-2-4-4 | 24" | |
| | | | | | | | | | | | | | |
| 60 | | | | | | 17 | SS | | | | 1-2-2-4 | 24" | |
| | | | | | | | | | | | | | |
| 65 | | | | 18 | SS | 1-1-2-2 | 24" | | | | | | |
| | | | | | | | | | | | | | |
| 70 | | | | 19 | SS | 2-4-7-8 | 24" | | | | | | |
| | | | | | | | | | | | | | |
| 75 | -56.3 | Very stiff, silty clay, some sand and gravel. (Marine Deposit) | | 20 | SS | 3-12-16-17 | 20" | | | | | | |
| | | | | | | | | | | | | | |
| 80 | -61.3 | | | | | | | | | | | | |
| Continued on sheet 3 of 3 | | | | 9762 | | | | | | | | | |

REMARKS



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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-7

SHEET 3 of 3
DATE: 1/29/01-1/30/01
DATUM BOSTON CITY BASE
BORING METHOD CASD WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|--|---------|------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 85 | | Compact to dense, gray, well-graded mixture of silt, sand and gravel, some clay. (Glacial Till) |  | 21 | SS | 10-18-29-38 | 6" | | | |
| | | | | | | | | | | |
| | | | | 22 | SS | 21-23-25-24 | 18" | | | |
| | | | | | | | | | | |
| 90 | | Very soft, gray to dark gray, completely to severely weathered Cambridge Argillite. |  | 23 | SS | 12-10-17-25 | 16" | | | |
| | | | | | | | | | | |
| | | | | 24 | SS | 23-23-33-40 | 16" | | | |
| | | | | | | | | | | |
| 94 | -75.3 | End of Borehole @ 106 Ft. | | 25 | SS | 94 | 6" | | | |
| | | | | | | | | | | |
| 105 | 106 | | | 26 | SS | 80-105 | 10" | | | |
| | -87.3 | | | | | | | | | |
| 110 | | | | | | | | | | |
| 115 | | | | | | | | | | |
| 120 | | | | | | | | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT. 140 LB. DROP 30 IN.


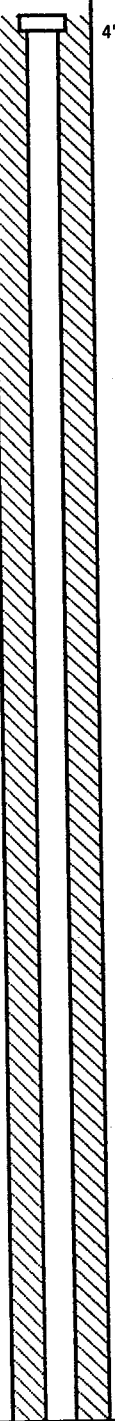




RECORD OF BOREHOLE G-8 (PZ)

SHEET 1 of 3

DATE: 1/26/01-1/30/01

DATUM BOSTON CITY BASE

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION |
|--------------|----------------|---|---|---------|------|-------------|-------------------|---|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | |
| 0 | 0 | Ground Surface | | | | | | | |
| | 19.1 | Asphalt | | | | | | | |
| | | Loose to very dense, brown, gravelly sand, trace silt to sand, some gravel, trace to some silt with brick, ash and cinder. (Fill) |  | 1 | SS | 68-50-43-30 | 12" | |  |
| | | | | 2 | SS | 5-4-4-4 | 6" | | |
| 5 | | | | 3 | SS | 4-3-2-3 | 9" | | |
| | 6.5 | Very loose to loose, gray, sand and silt, trace to some gravel with wood. (Fill) |  | 4 | SS | 3-2-3-3 | 18" | | |
| | 12.6 | | | 5 | SS | 3-15-39-120 | 14" | | |
| 10 | | | | 6 | SS | 120/3" | 3" | | |
| | | | | 7 | SS | 4-2-2-2 | 18" | | |
| | 14.5 | Loose, gray/brown, peat and organic silt, trace sand with wood obstructions. (Organic Deposit) |  | 8 | SS | 6-3-2-2 | 20" | | |
| 15 | 4.62 | | | | | | | | |
| | | | | 9 | SS | 14-18-18-24 | 24" | | |
| 20 | | Firm to stiff, gray, silty clay, trace gravel. (Marine Deposit) |  | | | | | | 90' of 2" Dia. PVC Riser pipe |
| | | | | 10 | SS | 6-3-3-3 | 0 | | |
| 25 | | | | | | | | | |
| | 27 | Continued on sheet 2 of 3 |  | 11 | SS | 6-4-5-10 | 10" | | |
| | -7.88 | | | | | | | | |
| 30 | | | | 12 | SS | 4-4-4-4 | 18" | | |
| 35 | | | | | | | | | |
| 40 | | | | | | | | | |

REMARKS

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Consulting Geotechnical Engineers

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-8 (PZ)

SHEET 2 of 3

DATE: 1/26/01-1/30/01

DATUM BOSTON CITY BASE

BORING METHOD CASED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|-------------|---------|------|------------|-------------------|---|----------------------------|-------------------------------------|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 45 | | Soft to firm, gray, silty clay. (Marine Deposit) | | 13 | SS | 3-2-2-3 | 20" | | | 90' of 2" Dia. PVC Riser pipe |
| | | | | | | | | | | |
| | | | | 14 | SS | 2-2-3-3 | 24" | | | |
| | | | | | | | | | | |
| 50 | | | | 15 | SS | 2-2-2-3 | 24" | | | |
| | | | | | | | | | | |
| | | | | 16 | SS | 2-3-3-5 | 24" | | | |
| | | | | | | | | | | |
| 60 | -40.9 | Stiff, gray, silty clay, trace sand, trace gravel. (Marine Deposit) | | 17 | SS | 5-6-6-7 | 10" | | | |
| | | | | | | | | | | |
| | | | | 18 | SS | 6-7-7-8 | 11" | | | |
| | | | | | | | | | | |
| 70 | | | | 19 | SS | 4-5-6-6 | 12" | | | |
| | | | | | | | | | | |
| | | | | 20 | SS | 6-8-12-16 | 16" | | | |
| | | | | | | | | | | |
| 80 | -60.9 | Continued on sheet 3 of 3 | | 21 | SS | 120/4" | 4" | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-8 (PZ)

SHEET 3 of 3

DATE: 1/26/01-1/30/01

DATUM BOSTON CITY BASE

BORING METHOD CASED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION |
|--------------|---------------|--|-------------|---------|------|-------------|-------------------|---|---|
| DEPTH | DEPTH ELEV | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | |
| 85 | | Dense to very dense, gray, well-graded mixture of silt, sand and gravel. (Glacial Till) | | 21 | SS | 120/4" | 4" | | <p>90' of 2" Dia. PVC Riser pipe</p> <p>Bentonite Chip Seal from 85' to 87'</p> <p>.010 Slot 2" Dia. PVC Screen from 88.5' to 93.5'</p> <p>Screen Backfilled with no.2 sand from 87' to 93.5'</p> <p>Bottom of Piezometer @ 93'6"</p> |
| | | | | 22 | SS | 23-21-25-23 | 8" | | |
| 90 | | | | 23 | SS | 15-23-27-33 | 6" | | |
| 93.5 | -74.4 | Very dense, gray to light brown, silt and clay intermixed with portions of hard argillite. Rock fabric discernable. (Completely to severely weathered Cambridge Argillite) | | 24 | SS | 70-120/4" | 8" | | |
| 95 | | | | 25 | SS | 86-120/3" | 9" | | |
| 100 | | | | 26 | SS | 120/3" | 3" | | |
| 105 | -86.1 | End of Borehole @ 105 Ft. | | | | | | | |
| 110 | | | | | | | | | |
| 115 | | | | | | | | | |
| 120 | | | | | | | | | |

REMARKS

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MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-11

SHEET 1 of 4

DATE: JUNE 14, 2001

DATUM BOSTON CITY BASE

BORING METHOD CASSED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|-------------|---------|------|------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 0 | 0 | Ground Surface | | | | | | | | |
| 0 | 19 | Asphalt (3") | | | | | | | | |
| 5 | | Fill | | | | | | | | |
| 10 | | | | | | | | | | |
| 12 | 7 | | | | | | | | | |
| 15 | | Organic Deposit | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 28.5 | -9.5 | | | | | | | | | |
| 30 | | | | 1 | SS | 30-5-6-5 | 15" | | | |
| 35 | | Stiff, mottled, gray and yellow silt and clay. (Marine Deposit) | | | | | | | | |
| 38 | | | | | | | | | | |
| 40 | -19 | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)



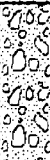
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Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-11

SHEET 2 of 4
DATE: JUNE 14, 2001
DATUM BOSTON CITY BASE
BORING METHOD CASED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|---|---------|------|------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 45 | 48 -29 | Stiff, yellowish, gray, silty clay. (Marine Deposit) |  | 2 | SS | 8-6-5-6 | 8" | | | |
| | | | | | | | | | | |
| 50 | | Firm, gray, silty clay. (Marine Deposit) | | 3 | SS | 2-3-3-4 | 24" | | | |
| 55 | | | | | | | | | | |
| 60 | 58 -39 | Very stiff, gray, stratified, sand and silty clay. (Marine Deposit) |  | 4 | SS | 2-3-9-9 | 24" | | | |
| 65 | | | | | | | | | | |
| 70 | 68 -49 | Stiff gray, silty clay with sand lenses. (Marine Deposit) | | 5 | SS | 5-5-5-6 | 24" | | | |
| 75 | 76 -57 | | | | | | | | | |
| 80 | | |  | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

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Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-11




SHEET 3 of 4

DATE: JUNE 14, 2001

DATUM BOSTON CITY BASE

BORING METHOD CASED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|--|---------|------|-----------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 85 | | Dense to very dense, gray, clay, silt, sand and gravel to silt, some sand, gravel and clay. (Glacial Till) |  | 6 | SS | 36-50-64-100\4" | 12" | | | |
| | | | | | | | | | | |
| 90 | | |  | 7 | SS | 20-18-23-25 | 18" | | | |
| | | | | | | | | | | |
| 94.5 | -75.5 | | | | | | | | | |
| 95 | | | | | | | | | | |
| 100 | | Very dense, gray, weathered argillite. |  | 8 | SS | 36-64-40-38 | 22" | | | |
| | | | | | | | | | | |
| 105 | | | | 9 | SS | 100\5" | 5" | | | |
| | | | | | | | | | | |
| 110 | | | | 10 | SS | 100\5" | 5" | | | |
| | | | | | | | | | | |
| 115 | | | | 11 | SS | 38-100\5" | 11" | | | |
| | | | | | | | | | | |
| 120 | | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-11

SHEET 4 of 4
DATE: JUNE 14, 2001
DATUM BOSTON CITY BASE
BORING METHOD CASSED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|-------------|---------|----------|------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| | | | | 12 | SS | 40-100/4" | 10" | REC=78% RQD=0% | | |
| | | | | | | | | | | |
| 125 | -106 | Very soft to medium hard, moderately to severely weathered, extremely to moderately fractured, green/gray medium grained diabase, close low to high angle joints. Rock Core Rate (Min/Ft) 5-5-5 | Run 1 | 13 | SS | 100/0" | 0" | | | |
| | -109 | | | | NQ RC | | 28" | | | |
| 130 | | Very soft to medium hard, completely to severely weathered, extremely to moderately fractured, gray and green medium grained diabase, very close to close, low to high angle joints. Rock Core Rate (Min/Ft) 6-5-5-5-6 | Run 2 | | NQ RC | | 22" | REC=37% RQD=0% | | |
| | -114 | | | | NQ RC | | 52" | | | |
| 135 | | Medium to moderately hard, moderately weathered, moderately fractured gray and green, medium grained, diabase, close to very close, horizontal to high angle joints, occasional calcite recrystallizations. Rock Core Rate (Min/Ft) 5-5-5-6-6 | Run 3 | | NQ RC | | 52" | REC=87% RQD=7.7% | | |
| | -119 | | | | NQ RC | | 52" | | | |
| 140 | | Medium, moderately weathered, moderately fractured, medium grained, gray and green, diabase, close to very close, low to high angle joints with a 2" seam of severely weathered, extremely fractured, gray and green diabase with calcite recrystallizations. Rock Core Rate (Min/Ft) 5-5-6-6-6 | Run 4 | | NQ RC | | 52" | REC=87% RQD=44.2% | | |
| | -124 | | | | | | | | | |
| | | End of Borehole @ 143 Ft. | | | | | | | | |
| 145 | | | | | | | | | | |
| 150 | | | | | | | | | | |
| 155 | | | | | | | | | | |
| 160 | | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
 BOSTON, MASSACHUSETTS
 LOCATION SEE FIG.2
 SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-12

SHEET 1 of 5
 DATE: JUNE 12, 2001
 DATUM BOSTON CITY BASE
 BORING METHOD CASSED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|-------------|---------|------|------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 0 | 0 | Ground Surface | | | | | | | | |
| | 19 | Asphalt (3") | | | | | | | | |
| 5 | | Fill | | | | | | | | |
| 10 | | | | | | | | | | |
| 14 | 5 | | | | | | | | | |
| 15 | | Organic Deposit | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 28 | -9 | | | | | | | | | |
| 30 | | | | 1 | SS | 6-11-11-11 | 8" | | | |
| 35 | | Very stiff, mottled, gray and yellow, silt and clay, some sand and gravel. (Marine Deposit) | | | | | | | | |
| 40 | 40 | | | | | | | | | |
| | -21 | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
 Consulting Geotechnical Engineers

DRAWN: M.B.S.
 CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS

LOCATION SEE FIG.2

SAMPLER HAMMER WT.140 LB. DROP 30 IN.





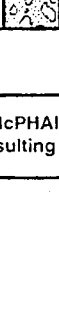
RECORD OF BOREHOLE G-12

SHEET 2 of 5

DATE: JUNE 12, 2001

DATUM BOSTON CITY BASE

BORING METHOD CASSED WASHED

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|--|---|---------|------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| | | Firm to stiff, gray, silty clay. (Marine Deposit) |  | 2 | SS | 5-3-5-6 | 15" | | | |
| 45 | | | | | | | | | | |
| | | |  | 3 | SS | 4-3-4-3 | 20" | | | |
| 50 | | | | | | | | | | |
| 55 | | |  | 4 | SS | 13-15-16-11 | 14" | | | |
| | | | | | | | | | | |
| | 57 -38 | Dense gray, gravelly, clayey sand. (Marine Deposit) |  | 5 | SS | 7-5-5-7 | 24" | | | |
| 60 | | | | | | | | | | |
| 65 | | |  | | | | | | | |
| 70 | 70 -51 | | | | | | | | | |
| | | Stiff gray, silty clay. (Marine Deposit) | | | | | | | | |
| 75 | | | | | | | | | | |
| | 79 -60 | | | | | | | | | |
| 80 | | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers


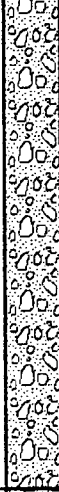


DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-12

SHEET 3 of 5
DATE: JUNE 12, 2001
DATUM BOSTON CITY BASE
BORING METHOD CASED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|---|---------|------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| 85 | | Very dense, gray silt, sand, gravel and clay with weathered rock. (Glacial Till) |  | 6 | SS | 76-66-34-60 | 12" | | | |
| | | | | | | | | | | |
| 90 | | | | 7 | SS | 18-23-26-32 | 0" | | | |
| | | | | | | | | | | |
| 95 | | |  | 8 | SS | 22-25-32-40 | 6" | | | |
| | | | | | | | | | | |
| 100 | | | | | | | | | | |
| | | | | | | | | | | |
| 104 | -85 | |  | 9 | SS | 100.4" | 4" | | | |
| 105 | | | | | | | | | | |
| | | | | | | | | | | |
| 110 | | | | 10 | SS | 100.1" | 1" | | | |
| | | | | | | | | | | |
| 115 | | Very dense gray, weathered argillite. |  | 11 | SS | 100.3" | 3" | | | |
| | | | | | | | | | | |
| 120 | | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2

RECORD OF BOREHOLE G-12

SHEET 4 of 5
DATE: JUNE 12, 2001
DATUM BOSTON CITY BASE
BORING METHOD CASSED WASHED

SAMPLER HAMMER WT.140 LB. DROP 30 IN.

| SOIL PROFILE | | | | SAMPLES | | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION | |
|--------------|----------------|---|-------------|---------|----------|-------------|-------------------|---|----------------------------|--|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | | | |
| | | Very dense gray, weathered argillite. | | 12 | SS | 25-32-46-63 | 24" | | | |
| | | | | | | | | | | |
| 125 | | | | 13 | SS | 38-100\3" | 9" | | | |
| | | | | | | | | | | |
| | | | | 14 | | 100\5" | 5" | | | |
| | | | | | | | | | | |
| 130 | | | | | | | | | | |
| | | | | | | | | | | |
| 135 | 135 | Very soft to medium hard, completely to moderately weathered, extremely to moderately fractured gray/green diabase, close to very close, low to high angle joints. Rock Core Rate (Min/Ft) 3-4-4-5-6 | | Run 1 | NQ RC | | 45" | REC=75% RQD=8.9% | | |
| | -116 | | | | | | | | | |
| 140 | 140 | Medium hard, moderately weathered, moderately fractured, gray/green, medium grained diabase, close low to high angle joints, very soft, severely weathered, extremely fractured, gray diabase. Rock Core Rate (Min/Ft) 5-5-5-6-6 | | Run 2 | NQ RC | | 54" | REC=90% RQD=16.7% | | |
| | -121 | | | | | | | | | |
| 145 | 145 | Very soft to medium hard, severely to moderately weathered, extremely to moderately fractured, gray, medium grained diabase. Rock Core Rate (Min/Ft) 5-5-5-5-5 | | Run 3 | NQ RC | | 28" | REC=47% RQD=14.3% | | |
| | -126 | | | | | | | | | |
| 150 | 150 | Very soft to medium hard, severely to moderately weathered, extremely to moderately fractured gray, diabase, medium grained, very close to close, horizontal to high angle fractures. Rock Core Rate (Min/Ft) 5-5-6-6-6 | | Run 4 | NQ RC | | 42" | REC=70% RQD=21.4% | | |
| | -131 | | | | | | | | | |
| 155 | 155 | Very soft to medium hard, severely to moderately weathered, extremely to moderately fractured, gray/green, diabase, medium grained, close to very close, horizontal to high angle fractures. Rock Core Rate (Min/Ft) 5-5-7-8-6 | | Run 5 | NQ RC | | 26" | REC=43% RQD=0% | | |
| | -136 | | | | | | | | | |
| 160 | 160 | | | | | | | | | |
| | -141 | | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

MGH PARKING FACILITY
BOSTON, MASSACHUSETTS
LOCATION SEE FIG.2
SAMPLER HAMMER WT.140 LB. DROP 30 IN.

RECORD OF BOREHOLE G-12

SHEET 5 of 5

DATE: JUNE 12, 2001

DATUM BOSTON CITY BASE

BORING METHOD CASED WASHED

| SOIL PROFILE | | | | SAMPLES | | | LABORATORY AND IN-SITU TEST RESULTS | PIEZOMETER INSTALLATION |
|--------------|----------------|--|-------------|---------|----------|------------|---|----------------------------|
| DEPTH | DEPTH ELEVN | DESCRIPTION | STRAT. PLOT | NUMBER | TYPE | BLOWS / 6" | RECOVERY (IN.) | |
| 165 | 165 | Soft to very soft, completely to very severely weathered, extremely fractured, gray diabase, Medium hard, moderately weathered, extremely to moderately fractured gray diabase, very close to close, horizontal to high angle fractures with occasional bands of recrystallizations. Rock Core Rate (Min/Ft) 5-5-14-6-6 | | Run 6 | NQ RC | | 31" | REC=52% RQD=10% |
| 165 | 146 | End of Borehole @ 165 Ft. | | | | | | |
| 170 | | | | | | | | |
| 175 | | | | | | | | |
| 180 | | | | | | | | |
| 185 | | | | | | | | |
| 190 | | | | | | | | |
| 195 | | | | | | | | |
| 200 | | | | | | | | |

REMARKS No samples taken. (0-30 Ft.)

McPHAIL ASSOCIATES, INC.
Consulting Geotechnical Engineers

DRAWN: M.B.S.
CHECKED: C.M.E.

APPENDIX D

APPENDIX E

APPENDIX F

326 Cambridge Street

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.

BORING 1

GROUND SURFACE

| | | | |
|-------|--------------------------------------|----|--------------------------|
| | | 10 | |
| | | 13 | |
| | | 9 | S#1, FROM G.S. TO 2'0" |
| | | 7 | RECOVERED 10" |
| | <u>F I L L</u> | 5 | |
| | | 3 | |
| | SAND, | 3 | S#2, FROM 2'0" TO 4'0" |
| | | 3 | RECOVERED 7" |
| | GRAVEL, | 1 | |
| | | 3 | |
| | BRICK | 2 | S#3, FROM 4'0" TO 6'0" |
| | | 2 | RECOVERED 5" |
| | | 4 | |
| 7'0" | | 6 | S#4, FROM 6'0" TO 8'0" |
| | | 3 | RECOVERED 4" |
| | <u>F I L L</u> | 2 | |
| | | 2 | |
| | CLAY, | 3 | S#5, FROM 8'0" TO 10'0" |
| | FINE SAND | 2 | RECOVERED 7" |
| | | 3 | |
| 10'6" | | | |
| 11'6" | USED ROLLER BIT THROUGH OBSTRUCTION. | | |
| | | 6 | |
| | STIFF CLAY, | 7 | S#6, FROM 12'0" TO 14'0" |
| | | 9 | RECOVERED 20" |
| | TRACE TO | 31 | |
| | | 22 | |
| | LITTLE SAND | 14 | S#7, FROM 14'0" TO 16'0" |
| | | 16 | RECOVERED 14 |
| | | 15 | |
| 17'0" | | | |
| | VERY DENSE | | |
| | FINE SAND, | 21 | |
| | | 23 | S#8, FROM 20'0" TO 22'0" |
| | SILT, CLAY | 34 | RECOVERED 4" |
| | | 68 | |
| 25'0" | | | |

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.

BORING 1 (CONTINUED)

25'0"

VERY DENSE
FINE SAND, SILT,
CLAY

28
41
30
45

S#9, FROM 25'0" TO 27'0"
RECOVERED 16"

10
16
21
26

S#10, FROM 30'0" TO 32'0"
RECOVERED 18"

(PUSHED COBBLE FROM
33'0" TO 35'0")

67
86
110
134

SAMPLED FROM 33'0" TO 35'0"
NO RECOVERY

36'0"

MEDIUM DENSE

TO DENSE, COARSE TO

FINE SAND,

SILT & CLAY

9
12
15
19

S#11, FROM 36'0" TO 38'0"
RECOVERED 14"

15
14
18
22

SAMPLED FROM 40'0" TO 42'0"
NO RECOVERY

45'0"

(CONTINUED ON SHEET NO. 3)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.**BORING 1 (CONTINUED)**

| | | | |
|-------|-------------------|----------------------|--|
| 45'0" | | 14 18 22 37 | S#12, FROM 45'0" TO 47'0" RECOVERED 14" |
| | DENSE MEDIUM TO | | |
| | FINE SAND, SILT, | 14 14 27 30 | S#13, FROM 50'0" TO 52'0" RECOVERED 16" |
| | LITTLE GRAVEL, | | |
| | CLAY | 10 13 28 28 | S#14, FROM 55'0" TO 57'0" RECOVERED 14" |
| 60'0" | | 17 35 41 45 | S#15, FROM 60'0" TO 62'0" RECOVERED 7" |
| | VERY DENSE SILT, | | |
| | FINE SAND, LITTLE | | |
| | GRAVEL & CLAY | | |
| 67'0" | | 16 21 24 33 | S#16, FROM 65'0" TO 67'0" RECOVERED 14" |

(CONTINUED ON SHEET NO. 4)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.

BORING 1 (CONTINUED)

67'0"

WATER LEVEL 6'6"

SIZE OF CASING NW, LENGTH 20'0"

NUMBER OF DRIVE SAMPLES (S), 16

DRILLER: F. WINGERTER, INSPECTOR: L. QUINN

DATE STARTED & COMPLETED: 4-25-85, 4-26-85

OBSERVATION WELL INSTALLED (2" PVC PIPE, 15'0" SLOTTED,
5'0" SOLID) 20.2' BELOW GROUND SURFACE, INCLUDING ROADWAY BOX.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches \pm . Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches \pm .

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142Date MAY 2, 1985Job. No. 85217Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672)Scale 1" = 3 ft.

BORING 2

GROUND SURFACE

| | | | |
|-------|-----------------|-----|---------------------------------|
| | | 7 | |
| | | 10 | |
| | | .12 | S#1, FROM G.S. TO 2'0" |
| | | 9 | RECOVERED 12" |
| | <u>FILL</u> | 5 | |
| | | 4 | |
| | SAND, GRAVEL, | 3 | S#2, FROM 2'0" TO 4'0" |
| | | 7 | RECOVERED 8" |
| | | 3 | |
| | TRACE BRICK, | 7 | |
| | | 83 | S#3, FROM 4'0" TO 6'0" |
| | | 60 | RECOVERED 7" |
| | SILT, COBBLES | 5 | |
| | | 5 | |
| 8'0" | | 7 | |
| | | 7 | S#4, FROM 6'0" TO 8'0", REC. 5" |
| | <u>FILL</u> | 5 | |
| | | 3 | |
| | SILTY FINE SAND | 4 | S#5, FROM 8'0" TO 10'0" |
| | & CLAY, TRACE | 3 | RECOVERED 19" |
| | COARSE TO FINE | 3 | |
| 11'0" | SAND | 5 | |
| | | 7 | S#6, FROM 10'0" TO 12'0" |
| | VERY STIFF | 9 | RECOVERED 14" |
| | | 9 | |
| | | 10 | |
| | SILTY CLAY, | 11 | S#7, FROM 12'0" TO 14'0" |
| | | 14 | RECOVERED 9" |
| | TRACE FINE | | |
| | SAND | | |
| 18'0" | | | |
| | HARD CLAY, | | |
| | | | |
| | FINE SAND, | 11 | |
| | | 17 | |
| | | 21 | S#8, FROM 20'0" TO 22'0" |
| | LITTLE GRAVEL & | 23 | RECOVERED 19" |
| | | | |
| | SILT | | |
| 25'0" | | | |

(CONTINUED ON SHEET NO. 2)

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.**BORING** 2 (CONTINUED)

25'0"

| | |
|-------------------------|-----|
| | 26 |
| | 62 |
| | .67 |
| | 75 |
| VERY DENSE SILT, CLAY | |
| & FINE SAND, LITTLE | |
| | 33 |
| | 26 |
| | 20 |
| | 26 |
| GRAVEL, FEW COBBLES | |
| 35'0" | |
| | 8 |
| | 9 |
| | 17 |
| | 18 |
| 37'0" | |
| MEDIUM DENSE FINE SAND, | |
| SILT, SOME CLAY, | |
| LITTLE GRAVEL | |

S#9, FROM 25'0" TO 27'0"
RECOVERED 18"S#10, FROM 30'0" TO 32'0"
RECOVERED 14"S#11, FROM 35'0" TO 37'0"
RECOVERED 19"

WATER LEVEL 7'6"

SIZE OF CASING NW, LENGTH 15'0"

NUMBER OF DRIVE SAMPLES (S), 11

DRILLER: F. WINGERTER, INSPECTOR: L. QUINN

DATE STARTED & COMPLETED: 4-26-85, 4-29-85

OBSERVATION WELL INSTALLED (2" PVC PIPE, 15'0" SLOTTED,
5'0" SOLID), 20.1' BELOW GROUND SURFACE, INCLUDING ROADWAY
BOX.

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches \pm . Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches \pm .

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217
 Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.

BORING 3

| | | |
|----------------|--|-----|
| GROUND SURFACE | | |
| 1'0" | ASPHALT | |
| | FILL SAND, GRAVEL, BRICK, LITTLE CLAY, SILT | 2 |
| | | 4 |
| | | 2 |
| | | 5 |
| 8'0" | | 4 |
| | | 7 |
| | | 11 |
| | | 3 |
| | | 2 |
| 10'0" | SAND, CLAY, SOME GRAVEL, SILT FILL | 3 |
| | | 5 |
| | | 3 |
| | | 2 |
| | | 3 |
| 14'0" | SILT, FINE SAND, SOME CLAY, TRACE GRAVEL FILL | 2 |
| | | 3 |
| | | 8 |
| | | 9 |
| | | 5 |
| 17'0" | HARD SILT & CLAY, TRACE COARSE TO FINE SAND, FEW COBBLES | 7 |
| | | 125 |
| | | |
| | | |
| | | |
| 21'0" | HARD CLAY, TRACE OF FINE SAND | 12 |
| | | 17 |
| | | 18 |
| | | 22 |
| | | |

S#1, FROM 2'0" TO 4'0"
RECOVERED 13"

S#2, FROM 4'0" TO 6'0"
RECOVERED 14"

S#3, FROM 6'0" TO 8'0"
RECOVERED 8"

S#4, FROM 8'0" TO 10'0"
RECOVERED 14"

S#5, FROM 10'0" TO 12'0"
RECOVERED 13"

SAMPLED FROM 12'0" TO 14'0"
NO RECOVERY

S#6, FROM 14'0" TO 15'0"
RECOVERED 8"

S#7, FROM 19'0" TO 21'0"
RECOVERED 24"

WATER LEVEL 10'0"
 USED 6" AUGERS, LENGTH 19'0"
 NUMBER OF DRIVE SAMPLES (S), 7
 DRILLER: F. WINGERTER, INSPECTOR: L. QUINN
 DATE STARTED & COMPLETED: 4-29-85

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 2, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA. (H&A FILE 5672) Scale 1" = 3 ft.

BORING 4

GROUND SURFACE

| | | | |
|-------|---|-------|---|
| 8'6" | <u>FILL</u> SAND, GRAVEL, BRICK, CONCRETE (POSSIBLE FOUNDATION WALL 4' - 8.5') | 4 | S#1, FROM G.S. TO 2'0" RECOVERED 4" |
| | | 5 | |
| | | 6 | |
| | | 6 | |
| | | 3 | S#2, FROM 2'0" TO 4'0" RECOVERED 4" |
| | | 3 | |
| | | 4 | |
| | | 9 | S#3, FROM 4'0" TO 6'0" NO RECOVERY |
| | | 2 | |
| | | 4 | |
| | | 4 | |
| | | 1 | S#4, FROM 9'0" TO 11'0" RECOVERED 13" |
| 11'0" | 6 | | |
| | 7 | | |
| | 12 | | |
| | 12 | | |
| 14'0" | FINE TO COARSE SAND, GRAVEL, LITTLE CLAY, FEW COBBLES <u>FILL</u> | 31 | S#5, FROM 11'0" TO 11'8" RECOVERED 4" |
| | | 61/2" | |
| | | 9 | |
| | | 12 | |
| 17'0" | VERY STIFF, COARSE TO FINE SAND, CLAY, LITTLE SILT, GRAVEL | 16 | S#6, FROM 14'0" TO 16'0" RECOVERED 19" |
| | | 20 | |
| | | 25 | |
| | | 31 | |
| 21'0" | VERY DENSE FINE SAND, GRAVEL, SOME SILT, CLAY | 34 | S#7, FROM 19'0" TO 21'0" RECOVERED 12" |
| | | 36 | |
| | | | |
| | | | |

WATER LEVEL 12'0"

USED 6" AUGERS, LENGTH 19'0"

NUMBER OF DRIVE SAMPLES (S), 6

DRILLER: F. WINGERTER, INSPECTOR: L. QUINN

DATE STARTED & COMPLETED: 4-29-85

All samples have been visually classified by HJD Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches ±. Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches ±.

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 22, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA (H&A FILE 5762) Scale 1" = 3 ft.

BORING 5

GROUND SURFACE

| | | | |
|-------|-------------------|----|----------------------------|
| | | | |
| | <u>F I L L</u> | | |
| | SAND, | 2 | |
| | | 2 | |
| | GRAVEL, BRICK, | 8 | S/#1, FROM 4'0" TO 6'0" |
| | | 8 | RECOVERED 24" |
| | ASHES | 8 | |
| | | 18 | |
| | | 18 | S/#2, FROM 6'0" TO 8'0" |
| | | 17 | RECOVERED 8" |
| | | 10 | |
| | | 7 | |
| | | 7 | SAMPLED FROM 8'0" TO 10'0" |
| | | 3 | NO RECOVERY |
| 10'6" | | | |
| | | 5 | |
| | STIFF YELLOW CLAY | 4 | S/#3, FROM 10'6" TO 12'6" |
| | | 4 | RECOVERED 8" |
| 12'6" | | 8 | |
| | | 6 | |
| | VERY STIFF | 8 | |
| | YELLOW CLAY | 10 | |
| 14'6" | | 12 | |

1. WATER LEVEL 7'4"
 SIZE OF AUGERS, 6" LENGTH 5'0", NW CASING, LENGTH 8'0"
 DRILLER: B. KNOX, INSPECTOR: R. BURSAW
 DATE STARTED & COMPLETED: 5-21-85

All samples have been visually classified by DRILLER. Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches \pm . Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches \pm .

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 22, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA (H&A FILE 5762) Scale 1" = 3 ft.

BORING 6

| | | |
|----------------|-------------------------------------|--|
| GROUND SURFACE | | |
| 9'0" | <u>F I L L</u> | 10 |
| | | 15 |
| | | 14 |
| | | 9 |
| | | 4 |
| | | 4 |
| | | 4 |
| | | 6 |
| | | 2 |
| | | 2 |
| | SAND, GRAVEL, BRICK, CONCRETE | 2 |
| | | 10 |
| | | 6 |
| | VERY STIFF YELLOW CLAY | 3 |
| | | 19 |
| | | 12 |
| | | 18 |
| | | 19 |
| | | 13 |
| | | 8 |
| | | 9 |
| | | 12 |
| | | 14 |
| 13'0" | | |
| | | S#1, FROM G.S. TO 2'0" RECOVERED 11" |
| | | SAMPLED FROM 2'0" TO 4'0" NO RECOVERY |
| | | S#2, FROM 4'0" TO 6'0" RECOVERED 17" |
| | | S#3, FROM 6'0" TO 8'0" RECOVERED 5" |
| | | S#4, FROM 8'0" TO 9'0" RECOVERED 13" |
| | | S#4A, FROM 9'0" TO 10'0" RECOVERED 11" |
| | | SAMPLED FROM 10'0" TO 12'0" NO RECOVERY |
| | | PUSHED SAMPLER FROM 12'0" TO 13'0" |

WATER LEVEL 6'6"

SIZE OF AUGERS 6", LENGTH 8'0"

DRILLER: B. KNOX, INSPECTOR: R. BURSAW

DATE STARTED & COMPLETED: 5-21-85

All samples have been visually classified by DRILLER Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches \pm . Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches \pm .

CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET

P.O. BOX 321

MEDFORD, MASSACHUSETTS 02155

Telephone 391-4500

To HALEY & ALDRICH, INC., 238 MAIN ST., CAMBRIDGE, MA. 02142 Date MAY 22, 1985 Job. No. 85217

Location PROPOSED OFFICE BUILDING, 326 CAMBRIDGE ST., BOSTON, MA (H&A FILE 5762) Scale 1" = 3 ft.

BORING 7

| | | |
|----------------|--|---------|
| GROUND SURFACE | | |
| 0'6" | ASPHALT | 14 |
| | | 15 |
| | | 11 |
| | | 11 |
| | | 7 |
| | FILL | 5 |
| | | 7 |
| | | 12 |
| | | 5 |
| | SAND, | 9 |
| | | 13 |
| | GRAVEL, BRICK, | 14 |
| | | 8 |
| | CLAY, SILT, CINDERS | 11 |
| | | 10 |
| | | 9 |
| | | 7 |
| | | 8 |
| | | 6 |
| | | 8 |
| | | 15 |
| 11'6" | | 7 |
| | INORGANIC SILT, TRACE OF FINE SAND & SHELLS | 8 |
| | | 12 |
| | | WOR/18" |
| | | 2 |
| 15'0" | | 4 |
| | VERY STIFF | 8 |
| | YELLOW | 9 |
| | CLAY | 11 |
| | | 11 |
| | | 12 |
| 18'0" | | 11 |

S#1, FROM 0'6" TO 2'6"
RECOVERED 16"

S#2, FROM 2'6" TO 4'6"
RECOVERED 23"

S#3, FROM 4'6" TO 6'6"
RECOVERED 7"

S#4, FROM 6'6" TO 8'6"
RECOVERED 5"

S#5, FROM 8'6" TO 10'6"
RECOVERED 14"

S#6, FROM 10'6" TO 11'6"
RECOVERED 10"

S#6A, FROM 11'6" TO 12'6"
RECOVERED 10"

S#7, FROM 12'6" TO 15'0"
RECOVERED 8"

S#7A, FROM 15'0" TO 16'0"
RECOVERED 7"

S#8, FROM 16'0" TO 18'0"
RECOVERED 8"

WATER LEVEL 7'6"

SIZE OF AUGERS 6", LENGTH 8'0"

DRILLER: B. KNOX, INSPECTOR: R. BURSAW

DATE STARTED & COMPLETED: 5-21-85

All samples have been visually classified by DRILLER. Unless otherwise specified, water levels noted were observed at completion of borings, and do not necessarily represent permanent ground water levels. Figures in right hand column indicate number of blows required to drive TWO-INCH SPLIT SAMPLER 6 inches using 140 lb. weight falling 30 inches \pm . Figures in column to left (if noted) indicate number of blows to drive casing one foot, using 300 lb. weight falling 24 inches \pm .

MGH Professional Office Building



GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

TO Haley & Aldrich, Inc.

ADDRESS Cambridge, Mass.

PROJECT NAME Monitor Wells, 261 Cambridge St

LOCATION BOSTON, MASS.

REPORT SENT TO above

PROJ. NO. _____

SAMPLES SENT TO taken at site

OUR JOB NO. 87-623

SHEET 1 OF 1

DATE _____

HOLE NO. B-6

LINE & STA. _____

OFFSET _____

SURF. ELEV. 17.5 ft.

| GROUND WATER OBSERVATIONS | | | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|-------------------------|-------------------------|--------------------------------|-------------|---------------|----------|--------------------------------------|---------------|
| At <u>6'-9"</u> | after <u>comp</u> Hours | Type <u>Hollow-Stem</u> | Size I.D. <u>Augers 3-3/4"</u> | <u>S/S</u> | <u>1-3/8"</u> | | START <u>1/13/87</u> | <u>9 a.m.</u> |
| At _____ | after _____ Hours | Hammer Wt. _____ | Hammer Fall _____ | <u>140#</u> | <u>30"</u> | BIT | COMPLETE <u>1/13/87</u> | <u>9 a.m.</u> |
| | | | | | | | TOTAL HRS. _____ | |
| | | | | | | | BORING FOREMAN <u>P. Thornsberry</u> | |
| | | | | | | | INSPECTOR <u>M.J. Condran</u> | |
| | | | | | | | SOILS ENGR. _____ | |

LOCATION OF BORING:

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev. | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|--------------------------------|-------------------------------|----------------------|-------------------------|------|----------|---------------------------------------|---------------------------|--|--------|-----|------|
| | | | | From 0-6 | 6-12 | To 12-18 | | | | No. | Pen | Rec. |
| | | 0' - 2' | D | 10 | 7 | 5 | | | Brown fine to coarse SAND & gravel, FILL " " & brick fill | 1 | 24' | 18" |
| | | 2' - 3' | D | 40 | 140 | refusal | | | | 2 | 12' | 8" |
| | | 4' - 6' | D | 33 | 10 | 17 | | | | 3 | 24' | 22" |
| | | 6' - 7' | D | 13 | | | | | | 4 | 12' | 10" |
| | | 8' - 10' | D | 4 | 4 | 6 | | | | 5 | 24' | 18" |
| | | 10' - 12' | D | 3 | 2 | 1 | | 10'-0" | Black organic SILT in wash water | 6 | 24' | 0" |
| | | 12' - 14' | D | 1 | | | | 13'-0" | | 7 | 24' | 4" |
| | | 14' - 16' | D | 6 | 8 | 21 | | 14'-0" | Gray-brown silty medium to fine SAND | 8 | 24' | 16" |
| | | 16' - 18' | D | 25 | | | | 18'-0" | | 9 | 24' | 18" |
| | | | | 17 | 18 | 21 | | | Bottom of Boring 18'-0" Installed 2" PVC Monitor well @ 14' Used: 10' of screen, 4' of riser, 4 bags of Ottawa sand, 1/4 bag of cement, 25 lbs. bentonite balls, and 1 road box. | | | |
| | | | | 19 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

GROUND SURFACE TO 14'

USED augers CASING: THEN S/S to 18' then inst. well

Sample Type

D=Dry C=Cored W=Washed

UP=Undisturbed Piston

TP=Test Pit A=Auger V=Vane Test

UT=Undisturbed Thinwall

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

and 35 to 50%

140 lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density Cohesive Consistency

0-10 Loose 0-4 Soft 30 + Hard

10-30 Med. Dense 4-8 M/Stiff

30-50 Dense 8-15 Stiff

50+ Very Dense 15-30 V-Stiff

SUMMARY:

Earth Boring 18'

Rock Coring _____

Samples 9

HOLE NO. B-6



GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 1

DATE _____

HOLE NO. B-101

LINE & STA. _____

OFFSET _____

SURF. ELEV. _____

TO Haley & Aldrich, Inc.

ADDRESS Cambridge, Mass.

PROJECT NAME M.G.H. Professional

LOCATION Boston, Mass.

REPORT SENT TO Above / Office Bldg. & Exec

PROJ. NO. 6217-01

SAMPLES SENT TO Taken At Site

OUR JOB NO. 88-524

| GROUND WATER OBSERVATIONS | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|--------------------------|------------------------|---------------|----------|--------------------------------------|-------------------|
| At <u>9'</u> | <u>2/11/88 AM</u> | Type <u>HW</u> | <u>S/S</u> | | START <u>2/10/88</u> | <u>_____</u> a.m. |
| | after <u>_____</u> Hours | Size I.D. <u>4"</u> | <u>1-3/8"</u> | | COMPLETE <u>2/11/88</u> | <u>_____</u> p.m. |
| (w/19' Casing) | | Hammer Wt. <u>300#</u> | <u>140#</u> | BIT | TOTAL HRS. _____ | |
| At _____ | after _____ Hours | Hammer Fall <u>24"</u> | <u>30"</u> | | BORING FOREMAN <u>G. Brouillette</u> | |
| | | | | | INSPECTOR _____ | |
| | | | | | SOILS ENGR. <u>C.S. Osgood</u> | |

LOCATION OF BORING

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sampler | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev. | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|--------------------------------|-------------------------------|-----------------------|-------------------------|------|-------|---------------------------------------|---------------------------|---|--------|-----|-----|
| | | | | From 0-6 | 6-12 | 12-18 | | | | No | Pen | Rec |
| | | 0'-2' | D | 5 | 10 | 11 | | | 6" Topsoil-Brown fine to medium SAND & Silt (Fill) | 1 | 24" | 9" |
| | | | | 12 | | | | 3' | | | | |
| | | 4'-6' | D | 9 | 7 | 24 | | | Brown & Black fine to medium SAND & Cinder (Fill) & Cement & Brick (Fill) | 2 | 24" | 18' |
| | | | | 40 | | | | 9' | | | | |
| | | 9'-11' | D | 10 | 5 | 5 | | | (2 attempts) Gray Brown fine to medium SAND & Silt & Clay (Fill) some Brick, Wood | 3 | 24" | 11" |
| | | | | 5 | | | | 14' | | | | |
| | | 14'-16' | D | 2 | 2 | 2 | | | Dark Brown fine organic SILT, trace of Fibrous | 4 | 24" | 18' |
| | | | | 1 | | | | 17' | | | | |
| | | 19'-21' | D | 13 | 27 | 40 | | | Gray silty CLAY, trace of medium Gravel | 5 | 24" | 24' |
| | | | | 45 | | | | | | | | |
| | | 24'-26' | D | 9 | 11 | 14 | | | | 6 | 24" | 24' |
| | | | | 27 | | | | | | | | |
| | | 29'-31' | D | 8 | 10 | 12 | | | " ", (no Gravel) | 7 | 24" | 24' |
| | | | | 14 | | | | | | | | |
| | | 34'-36' | D | 6 | 6 | 9 | | | | 8 | 24" | 24' |
| | | | | 11 | | | | | | | | |

GROUND SURFACE TO 19'

USED HW

"CASING: THEN S/S to Bottom

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TS=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2 O.D. Sampler
Cohesionless Density
0-10 Loose
10-30 Med. Dense
30-50 Dense
50+ Very Dense
Cohesive Consistency
0-4 Soft
4-8 M/Stiff
8-15 Stiff
15-30 V-Stiff

SUMMARY:
Earth Boring 61'
Rock Coring
Samples 13

HOLE NO B-1







GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 1 OF 1
DATE _____
HOLE NO. B-104
LINE & STA. _____
OFFSET _____
SURF. ELEV. _____

TO Haley & Aldrich, Inc. ADDRESS Cambridge, Mass.
PROJECT NAME M.G.H. Professional LOCATION Boston, Mass.
REPORT SENT TO Above / Office Bldg. & Exec PROJ. NO. 6217-01
SAMPLES SENT TO Taken At Site OUR JOB NO. 88-524

| GROUND WATER OBSERVATIONS | | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|-------------------|-------------|--------|---------------|----------|----------------|-----------------------|
| At <u>Mud Level 5'</u> | after _____ Hours | Type | HW | S/S | | START | <u>2/17/88</u> |
| | | Size I.D. | Spun | <u>1-3/8"</u> | | COMPLETE | <u>2/18/88</u> |
| At _____ | after _____ Hours | Hammer Wt | | <u>140#</u> | BIT | TOTAL HRS. | |
| | | Hammer Fall | | <u>30"</u> | | BORING FOREMAN | <u>G. Brouillette</u> |
| | | | | | | INSPECTOR | |
| | | | | | | SOILS ENGR. | <u>C. S. Osgood</u> |

LOCATION OF BORING

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|-----------------------|-------------------------|----------------|-------------------------|---------|----------|------------------------------|--------------------|---|--------|-----|------|
| | | | | From 0-6 | To 6-12 | To 12-18 | | | | No | Pen | Rec. |
| | | 0'-2' | D | 3 | 5 | 7 | | | 6" Topsoil-Brown & Black fine to medium SAND & Cinder, some Brick (Fill) | 1 | 24" | 18' |
| | | 2'-4' | D | 7 | 7 | 15 | | | | 2 | 24" | 12' |
| | | | | 16 | | | | | | | | |
| | | 4'-6' | D | 9 | 25 | 20 | | | All Brick | 3 | 24" | 12' |
| | | | | 12 | | | | | | | | |
| | | 6'-8' | D | 10 | 8 | 7 | | | | 4 | 24" | 12" |
| | | | | 7 | | | | | | | | |
| | | 9'-11' | D | 4 | 4 | 4 | | 9' | Grayish silty CLAY (Fill) | 5 | 24" | 2" |
| | | | | 4 | | | | | | | | |
| | | 14'-16' | D | 23 | 28 | 30 | | | Gray fine to coarse SAND & Gravel & Glass (Fill) | 6 | 24" | 2" |
| | | | | 30 | | | | 17' | | | | |
| | | 19'-21' | D | 14 | 20 | 22 | | | Gray silty CLAY | 7 | 24" | 18 |
| | | | | 26 | | | | | | | | |
| | | 24'-26' | D | 8 | 11 | 16 | | | | 8 | 24" | 24 |
| | | | | 16 | | | | | | | | |
| | | 29'-31' | D | 4 | 4 | 8 | | | | 9 | 24" | 24 |
| | | | | 8 | | | | | | | | |
| | | 34'-36' | D | 3 | 4 | 7 | | 34' | Gray silty CLAY, some fine to medium Sand | 10 | 24" | 24" |
| | | | | 8 | | | | | | | | |
| | | | | | | | | 38'6" | Brown fine to coarse Gravel | | | |

| | | | | | |
|---------------------------------|------------------|---|-------------------------|--------------------------------|--|
| GROUND SURFACE TO <u>19'</u> | | USED <u>HW</u> | | CASING: THEN <u>S/S to 61'</u> | |
| Sample Type | Proportions Used | 140lb Wt. x 30' fall on 2" O.D. Sampler | SUMMARY: | | |
| D=Dry C=Cored W=Washed | Trace 0 to 10% | Cohesionless Density | Earth Boring <u>61'</u> | | |
| UP=Undisturbed Piston | Little 10 to 20% | 0-10 Loose | Rock Coring <u>15</u> | | |
| TP=Test Pit A=Auger V=Vane Test | some 20 to 35% | 10-30 Med. Dense | Samples _____ | | |
| | | 30-50 Hard | | | |
| | | 50-100 Very Hard | | | |
| | | 100+ Extremely Hard | | | |

GUILD DRILLING CO., INC.

100 WATER STREET

EAST PROVIDENCE, R. I.

SHEET 2 OF

DATE _____

HOLE NO. B-104

LINE & STA.

OFFSET _____

SURF. ELEV. _____

TO _____

ADDRESS _____

PROJECT NAME _____

LOCATION _____

REPORT SENT TO _____

PROJ NO 62-1701

SAMPLES SENT TO _____

OUR JOB NO 88-524

| GROUND WATER OBSERVATIONS | | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|-------------|-------|-------------------|---------|----------|----------------------|-------|
| At _____ | after _____ | Hours | Type _____ | _____ | _____ | START _____ | _____ |
| | | | Size: D. _____ | _____ | _____ | COMPLETE _____ | _____ |
| | | | Hammer Wt _____ | _____ | _____ | TOTAL HRS. _____ | _____ |
| At _____ | after _____ | Hours | Hammer Fall _____ | _____ | _____ | BORING FOREMAN _____ | _____ |
| | | | | | BIT | INSPECTOR _____ | _____ |
| | | | | | | SOILS ENGR. _____ | _____ |

LOCATION OF BORING

[illegible]

GROUND SURFACE TO

USED "CASING: THEN

Sample Type

D = Dry C = Cored W = Washed

UP = Undisturbed Piston

TP= Test Pit A= Auger V= Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density | Cohesive Consistency

0-10 Loose

10-30 Med. Dense

Cohesive Consistency

O-4 Soft

4-8 M/Stiff

SUMMARY:

SUMMARY:
Earth Boring _____

Rock Coring _____

Samples _____



GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

TO Haley & Aldrich, Inc.

ADDRESS Cambridge, Mass.

PROJECT NAME M.G.H. Professional

LOCATION Boston, Mass.

REPORT SENT TO Above / Office Bldg. & Exec

PROJ. NO. 6217-01

SAMPLES SENT TO Taken At Site

OUR JOB NO. 88-524

SHEET 1 OF 2

DATE _____

HOLE NO. B-107

LINE & STA. _____

OFFSET _____

SURF. ELEV. _____

| GROUND WATER OBSERVATIONS | | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|-------------|-------|-------------|--------------|---------------|----------------|----------------------------------|
| At _____ | after _____ | Hours | Type | HW/NW | S/S | START | <u>2/18/88</u> <u>_____</u> a.m. |
| At _____ | after _____ | Hours | Size I.D. | <u>4" 3"</u> | <u>1-3/8"</u> | COMPLETE | <u>2/19/88</u> <u>_____</u> a.m. |
| | | | Hammer Wt | <u>300#</u> | <u>140#</u> | TOTAL HRS. | |
| | | | Hammer Fall | <u>24"</u> | <u>30"</u> | BORING FOREMAN | <u>G. Brouillette</u> |
| | | | | | BIT | INSPECTOR | |
| | | | | | | SOILS ENGR. | <u>B. Buelow</u> |

LOCATION OF BORING:

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev. | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|-----------------------|-------------------------|----------------|-------------------------|---------|----------|------------------------------|---------------------|---|--------|-----|------|
| | | | | From 0-6 | To 6-12 | To 12-18 | | | | No | Pen | Rec. |
| | | 0'-2' | D | 5 | 6 | 15 | | | 12"-Topsoil-Brown fine to medium SAND & Gravel (Fill) (Brick @ 2') | 1 | 24" | 24" |
| | | | | 17 | | | | 4' | | | | |
| | | 4'-6' | D | 15 | 6 | 7 | | | Brown fine to medium SAND, & silty Clay, some Gravel (Fill) | 2 | 24" | 12" |
| | | | | 8 | | | | 8' | | | | |
| | | 9'-11' | D | 9 | 10 | 10 | | | Brown fine to medium SAND & Gravel, trace of Silt (Fill) | 3 | 24" | 6" |
| | | | | 10 | | | | 13' | | | | |
| | | 14'-16' | D | 10 | 18 | 34 | | | Brown & Gray silty CLAY | 4 | 24" | 24" |
| | | | | 40 | | | | | | | | |
| | | 19'-21' | D | 10 | 15 | 20 | | | | 5 | 24" | 24" |
| | | | | 25 | | | | | | | | |
| | | 24'-26' | D | 10 | 12 | 15 | | | | 6 | 24" | 24" |
| | | | | 21 | | | | | | | | |
| | | 29'-31' | D | 5 | 7 | 8 | | | | 7 | 24" | 24" |
| | | | | 10 | | | | | | | | |
| | | 34'-36' | D | 3 | 3 | 4 | | | | 8 | 24" | 24" |
| | | | | 5 | | | | 37'6" | | | | |
| | | | | | | | | | Gray fine to coarse SAND & Gravel & Cobbles | | | |

GROUND SURFACE TO 14' HW USED NW "CASING: THEN S/S TO BOTTOM OF BORING

| Sample Type | Proportions Used | 140lb Wt. x 30" fall on 2" O.D. Sampler | SUMMARY: |
|---------------------------------|------------------|---|------------------------|
| D=Dry C=Cored W=Washed | trace 0 to 10% | Cohesionless Density | Earth Boring <u>61</u> |
| UP=Undisturbed Piston | fine 10 to 20% | 0-10 Loose | Rock Coring |
| TP=Test Pit A=Auger V=Vane Test | some 20 to 35% | 10-30 Med. Dense | Samples <u>13</u> |
| | and 35 to 50% | 30-50 Dense | |
| | | 50-60 Very Dense | |
| | | Cohesive Consistency | |
| | | 0-4 Soft 30 + Hard | |
| | | 4-8 M/Stiff | |
| | | 8-15 Stiff | |
| | | 15-30 V-Stiff | |

HOLE NO. _____



GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

TO Haley & Aldrich, Inc.

ADDRESS Cambridge, Mass.

PROJECT NAME M.G.H. Professional

LOCATION Boston, Mass.

REPORT SENT TO Above / Office Bldg. & Exec PROJ. NO. 6217-01

SAMPLES SENT TO Taken At Site

OUR JOB NO. 88-524

SHEET 1 OF 2

DATE _____

HOLE NO. B-109

LINE & STA. _____

OFFSET _____

SURF. ELEV. _____

| GROUND WATER OBSERVATIONS | | | CASING | SAMPLER | CORE BAR | Date | Time |
|---------------------------|---------------------|-------|------------------------|---------------|----------|--------------------------------------|------|
| At <u>8'6"</u> | after <u>14'</u> HW | Hours | Type <u>HW</u> | <u>S/S</u> | | START <u>2/5/88</u> | a.m. |
| (2-8-88) AM | | | Size I.D. <u>4"</u> | <u>1-3/8"</u> | | COMPLETE <u>2/8/88</u> | p.m. |
| At _____ | after _____ | Hours | Hammer Wt. <u>300#</u> | <u>140#</u> | | TOTAL HRS. _____ | |
| | | | Hammer Fall <u>24"</u> | <u>30"</u> | BIT | BORING FOREMAN <u>G. Brouillette</u> | |
| | | | | | | INSPECTOR _____ | |
| | | | | | | SOILS ENGR. <u>C. S. Osgood</u> | |

LOCATION OF BORING:

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev. | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|-----------------------|-------------------------|----------------|-------------------------|------|----------|------------------------------|---------------------|---|--------|-----|-----|
| | | | | From 0-6 | 6-12 | To 12-18 | | | | No | Pen | Rec |
| | | 0'-2' | D | 7 | 9 | 10 | | | Brown fine to medium SAND & Gravel, little Brick & Cinder (Fill) trace of Cement @ 2' | 1 | 24' | 16" |
| | | | | 9 | | | | | | 2 | 24' | 14" |
| | | 2'-4' | D | 5 | 8 | 4 | | | | 3 | 24' | 1/2 |
| | | | | 4 | | | | | | 4 | 24' | 7" |
| | | 4'-6' | D | 3 | 4 | 3 | | | (Fill) | 5 | 24' | 12" |
| | | | | 5 | | | | | | 6 | 24' | 2" |
| | | 6'-8' | D | 7 | 2 | 3 | | | | 7 | 24' | 1/2 |
| | | | | 5 | | | | | | 8 | 24' | 24" |
| | | 8'-10' | D | 5 | 5 | 10 | | | Some Wood & silty CLAY & Oil (Fill) mixed | 9 | 24' | 24" |
| | | | | 21 | | | | | | 10 | 24' | 24" |
| | | 10'-12' | D | 4 | 5 | 8 | | | | 11 | 24' | 24" |
| | | | | 12 | | | | | | 12 | 24' | 24" |
| | | 12'-14' | D | 5 | 5 | 6 | | | Yellow Brown silty CLAY | 13 | 24' | 24" |
| | | | | 9 | | | | | | | | |
| | | 14'-16' | D | 28 | 33 | 31 | | | | | | |
| | | | | 44 | | | | | | | | |
| | | 16'-18' | D | 42 | 42 | 40 | | | " "(color changed to Gray) | | | |
| | | | | 38 | | | | | | | | |
| | | 19'-21' | D | 7 | 8 | 15 | | | | | | |
| | | | | 24 | | | | | | | | |
| | | 24'-26' | D | 10 | 10 | 12 | | | | | | |
| | | | | 14 | | | | | | | | |
| | | 29'-31' | D | 3 | 6 | 9 | | | | | | |
| | | | | 8 | | | | | | | | |
| | | 34'-36' | D | 5 | 8 | 8 | | | | | | |
| | | | | 10 | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

GROUND SURFACE TO 14'/34'

USED HW/NW CASING: THEN S/S to 61'

Sample Type

D=Dry C=Cored W=Washed

UP=Undisturbed Piston

TP=Test Pit A=Auger V=Vane Test

Proportions Used

trace 0 to 10%

little 10 to 20%

some 20 to 35%

140lb Wt. x 30" fall on 2" O.D. Sampler

Cohesionless Density Cohesive Consistency

0-10 Loose 0-4 Soft 30 + Hard

10-30 Med. Dense 4-8 M/Stiff

30-50 Dense 8-15 Stiff

SUMMARY:

Earth Boring 61'

Rock Coring _____

Samples 18'

HOLE NO. _____



GUILD DRILLING CO., INC.

100 WATER STREET EAST PROVIDENCE, R. I.

SHEET 2 OF
DATE
HOLE NO. B-109
LINE & STA.
OFFSET
SURF. ELEV.

TO ADDRESS
PROJECT NAME LOCATION
REPORT SENT TO PROJ. NO. 62-1701
SAMPLES SENT TO OUR JOB NO. 88-524

| GROUND WATER OBSERVATIONS | | | CASING | SAMPLER | CORE BAR. | Date | Time |
|---------------------------|-------------------------|-------------------------|--------|---------|-----------------|----------------------------|------|
| At <u> </u> | after <u> </u> Hours | Type <u> </u> | | | | START <u> </u> | |
| At <u> </u> | after <u> </u> Hours | Size I D. <u> </u> | | | | COMPLETE <u> </u> | |
| | | Hammer Wt <u> </u> | | | BIT <u> </u> | TOTAL HRS. <u> </u> | |
| | | Hammer Fall <u> </u> | | | | BORING FOREMAN <u> </u> | |
| | | | | | | INSPECTOR <u> </u> | |
| | | | | | | SOILS ENGR. <u> </u> | |

LOCATION OF BORING:

| DEPTH | Casing Blows per foot | Sample Depths From - To | Type of Sample | Blows per 6" on Sampler | | | Moisture Density or Consist. | Strata Change Elev. | SOIL IDENTIFICATION Remarks include color, gradation, Type of soil etc. Rock-color, type, condition, hardness, Drilling time, seams and etc. | SAMPLE | | |
|-------|-----------------------|-------------------------|----------------|-------------------------|---------|----------|------------------------------|---------------------|---|--------|------|-----|
| | | | | From 0-6 | To 6-12 | To 12-18 | | | | No. | Pen. | Re. |
| | | | | | | | | | Gray silty CLAY | | | |
| | | 39'-41' | D | 4 | 6 | 5 | | | | 14 | 24' | 24 |
| | | | | 6 | | | | | | | | |
| | | 44'-46' | D | 42 | 16 | 27 | | 44' | | 15 | 24' | 24 |
| | | | | 34 | | | | | Gray silty CLAY, trace of fine Sand | | | |
| | | 49'-51' | D | 18 | 29 | 23 | | | | 16 | 24' | 24 |
| | | | | 38 | | | | | | | | |
| | | 54'-56' | D | 15 | 15 | 60 | | | | 17 | 24'' | 2 |
| | | | | 79 | | | | | | | | |
| | | 59'-61' | D | 41 | 51 | 46 | | 59' | | | | |
| | | | | 48 | | | | 61' | Gray fine SAND | 18' | 24' | 1 |
| | | | | | | | | | Bottom of Boring 61' | | | |

GROUND SURFACE TO 14' / 34' USED HW / NW CASING: THEN S/S to 61'

Sample Type
D=Dry C=Cored W=Washed
UP=Undisturbed Piston
TP=Test Pit A=Auger V=Vane Test
UT=Undisturbed Thinwall

Proportions Used
trace 0 to 10%
little 10 to 20%
some 20 to 35%
and 35 to 50%

140lb Wt. x 30" fall on 2" O.D. Sampler
Cohesionless Density Cohesive Consistency
0-10 Loose 0-4 Soft 30 + Hard
10-30 Med. Dense 4-8 M/Stiff
30-50 Dense 8-15 Stiff
50 + Very Dense 15-30 V. Dense

SUMMARY:
Earth Boring 61'
Rock Coring
Samples 18

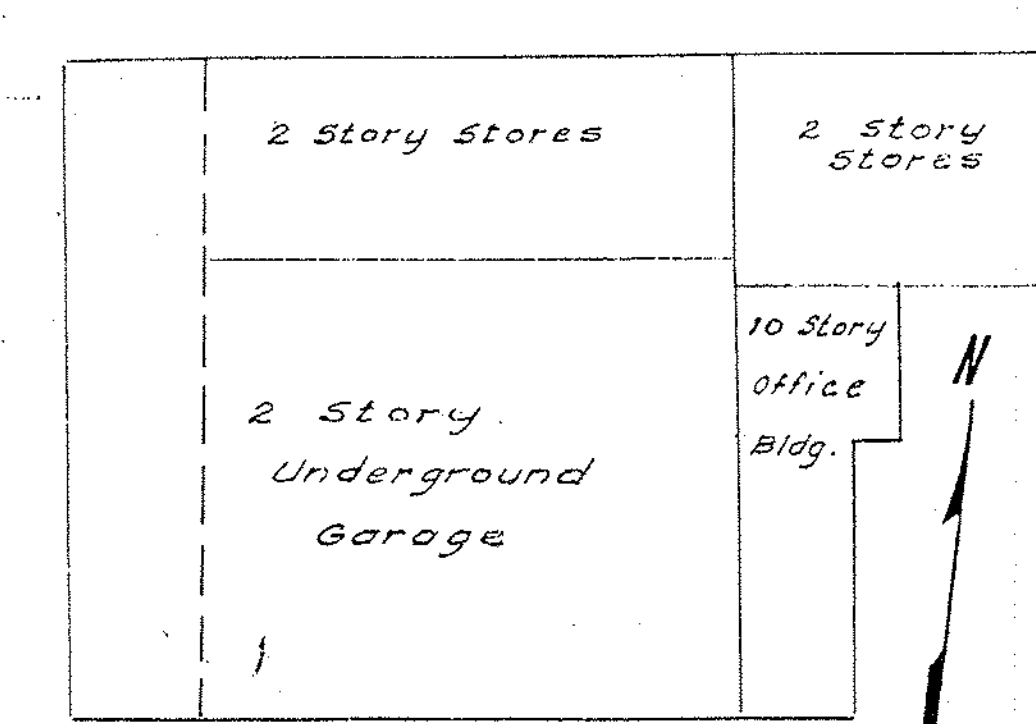
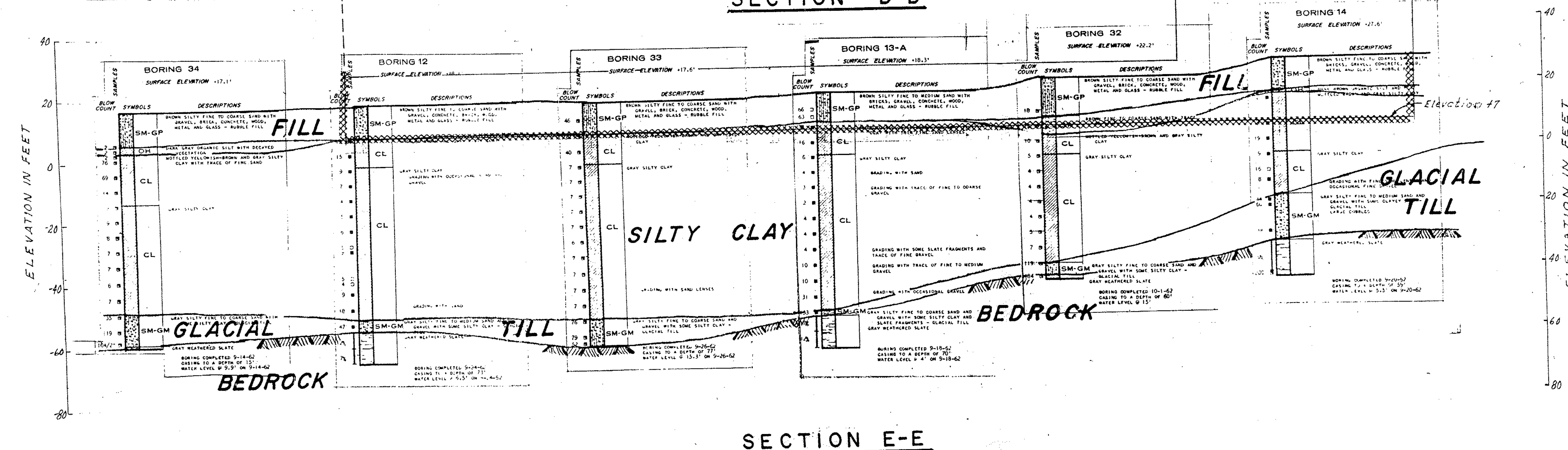
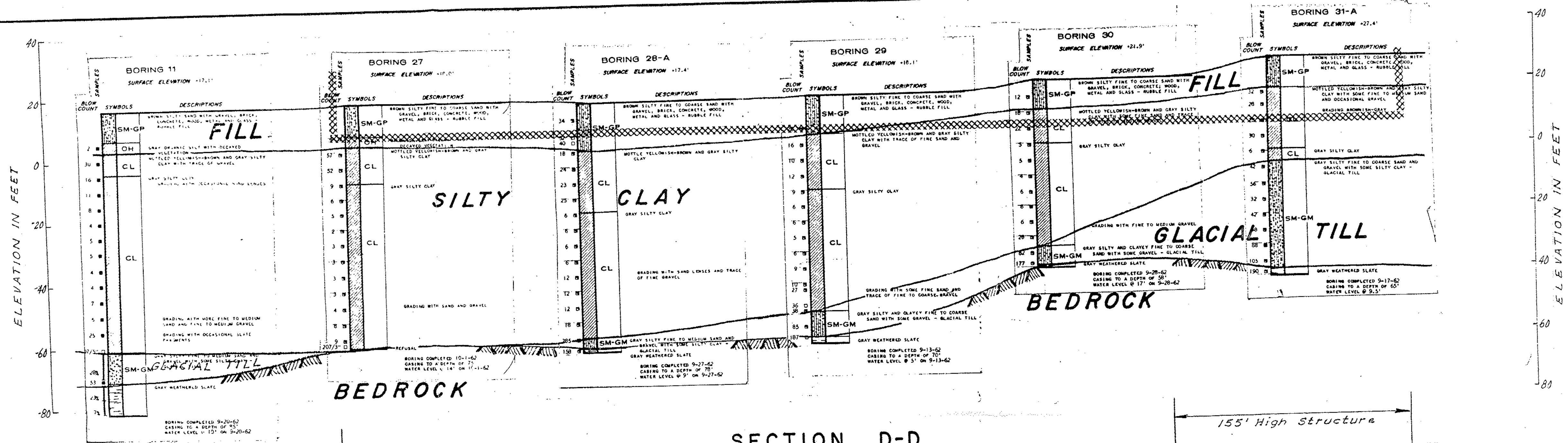
HOLE NO

| | | | | | | |
|---------------------------------|--|------------------|---|--|------------------|--|
| GROUND SURFACE TO | | 15 | USED Auger "CASING: THEN | | Installed Well | |
| Sample Type | | Proportions Used | 140lb Wt. x 30" fall on 2" O.D. Sampler | | SUMMARY: | |
| D=Dry C=Cored W=Washed | | trace 0 to 10% | Cohesionless Density | | Earth Boring 18' | |
| UP=Undisturbed Piston | | little 10 to 20% | 0-10 Loose | | Rock Coring | |
| TP=Test Pit A=Auger V=Vane Test | | some 20 to 35% | 10-30 Med. Dense | | Samples 9 | |
| UT=Undisturbed In-situ | | and 35 to 50% | 30-50 Dense | | | |
| | | | 50+ Very Dense | | HOLE NO. 110 | |
| | | | 0-4 Soft 30+ Hard | | | |
| | | | 4-8 M/Stiff | | | |
| | | | 8-15 Stiff | | | |
| | | | 15-30 V-Stiff | | | |





Charles River Plaza



No deviation from contract plans and specifications can be made until a Request for Construction Change, FHWA Form 2437, has been submitted and approved. (See Par. 4 - FHWA Supplementary General Conditions)

FHA 6

CHARLES RIVER PARK
CAMBRIDGE & BLOSSOM STREETS
BOSTON, MASS.

SOIL PROFILES

HALEY & ALDRICH, INC.
CONSULTING SOIL ENGINEERS
CAMBRIDGE, MASS.

| | | |
|--------------------------------|-------------------|-----------------|
| DATE OCTOBER 1963 6/8/65 | SCALE AS SHOWN | SHEET NO. 1C |
|--------------------------------|-------------------|-----------------|

FIGURE 3b

TEST BORING REPORT

Boring No. B100

Project CHARLES RIVER PLAZA ADDITION, CAMBRIDGE STREET, BOSTON, MA
 Client THE DAVIS COMPANIES
 Contractor GUILD DRILLING CO., INC.

File No. 27194-000
 Sheet No. 1 of 5
 Start September 23, 2002
 Finish September 26, 2002

| | Casing | Sampler | Barrel | Drilling Equipment and Procedures |
|-----------------------|--------|---------|--------|---|
| Type | HW | S | NX | Rig Make & Model: Dietrich D-50 Truck |
| Inside Diameter (in.) | 4.0 | 1 3/8 | 2.0 | Bit Type: Roller Bit |
| Hammer Weight (lb.) | 300 | 140 | - | Drill Mud: None |
| Hammer Fall (in.) | 24 | 30 | - | Casing: PW spun 22.3 /HW driven 24.0/NW spun 93.0 |
| | | | | Hoist/Hammer: Cat-Head Doughnut Hammer |

Driller K. Fisher

H&A Rep. P. Pope








Elevation

Datum

Location See Plan

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | | | | Sand | | | | | Field Test | | | |
|-------------|------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|-----------|-----------|------------|----------|------------|--|--|--|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | Strength | | | | |
| 0 | | | | | | | -Black bituminous ASPHALT- | | | | | | | | | | | | | | |
| | | | | | 0.3 | | -Reinforced CONCRETE- | | | | | | | | | | | | | | |
| | | | | | 1.7 | | -VOID- (Ground level of Parking Garage) | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | 10.0 | | -Reinforced CONCRETE- | | | | | | | | | | | | | | |
| | | | | | 11.2 | | -VOID- (First sublevel of Parking Garage) | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | |

USCS_TB4 USCSTB-CORE4.GDT G:\27194\000\27194\000\TB.GPJ Oct 17, 02

| Water Level Data | | | | | | Sample Identification | | Well Diagram | | Summary | |
|------------------|------|--------------------|------------------|----------------|-------|-----------------------|--------------------|---|----------------|---|--|
| Date | Time | Elapsed Time (hr.) | Depth (ft.) to: | | | O | Open End Rod |  | Riser Pipe | Overburden (lin. ft.) 94.0 Rock Cored (lin. ft.) 10.0 Samples S14, C2 | |
| | | | Bottom of Casing | Bottom of Hole | Water | T | Thin Wall Tube |  | Screen | | |
| 9/23/02 | | | 20.8 | 20.8 | Dry | U | Undisturbed Sample |  | Filter Sand | Boring No. B100 | |
| | | | | | | S | Split Spoon |  | Cuttings | | |
| | | | | | | G | Geoprobe |  | Grout | | |
| | | | | | | | |  | Concrete | | |
| | | | | | | | |  | Bentonite Seal | | |

Field Tests:

Dilatancy: R-Rapid, S-Slow, N-None

Plasticity: N-Nonplastic, L-Low, M-Medium, H-High

Toughness: L-Low, M-Medium, H-High

Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

¹SPT = Sampler blows per 6 in.²Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. B100

File No. 27194-000

Sheet No. 2 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | | % Fines | Field Test | | | | |
|-------------|---------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|------------|-----------|------------|--|--|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | | Dilatancy | Toughness | Plasticity | | |
| 20 | | | | | | | | | | | | | | | | | | |
| | | | | | 20.8 | | -Reinforced CONCRETE- | | | | | | | | | | | |
| | 19 3 18 9 | S1 1 | 22.3 24.3 | | 22.3 | SP | Medium dense brown poorly graded SAND with gravel (SP), mps 20 mm, no structure, no odor, moist. -FILL- | 25 | 40 | 25 | 5 | 5 | R | L | N | | | |
| 25 | | | | | | | | | | | | | | | | | | |
| | | | | | 26.5 | | | | | | | | | | | | | |
| | 5 7 7 9 | S2 24 | 29.0 31.0 | | | CL | Stiff olive brown lean CLAY (CL), mps < 0.05 mm, occasional silt partings, no odor, moist. -MARINE DEPOSIT- | | | | | 100 | N | H | H | | | |
| 30 | | | | | | | | | | | | | | | | | | |
| | 2 4 5 6 | S3 10 | 34.0 36.0 | | | CL | Stiff olive brown lean CLAY (CL), mps < 0.05 mm, occasional silt partings, no odor, moist. | | | | | 100 | N | H | H | | | |
| 35 | | | | | | | | | | | | | | | | | | |
| | 2 2 3 4 | S4 12 | 39.0 41.0 | | | CL | Similar to above except medium stiff. | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | WOR WOH/12" 4 | S5 24 | 44.0 46.0 | | | CL | Similar to above except very soft. | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | |
| | WOR | S6 | 49.0 | | | CL | Similar to above. | | | | | | | | | | | |

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler size

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. B100

Boring No. **B100**

TEST BORING REPORT

Boring No. B100
File No. 27194-000
Sheet No. 4 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | Fines | | Field Test | | | |
|-------------|----------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|------------|-----------|------------|----------|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | Strength |
| 80 | 25 45 40 34 | S12 8 | 79.0 81.0 | | | CL | Hard olive gray sandy lean CLAY (CL), mps 20 mm, no structure, no odor, moist. -GLACIAL TILL- | | 10 | 10 | 10 | 5 | 55 | N | H | H | |
| 85 | 40 36 43 60 | S13 12 | 84.0 86.0 | | | | Similar to above. Note: Coarse fraction consists of pieces of weathered argillite. | | | | | | | | | | |
| 90 | 14 17 31 75 | S14 12 | 89.0 91.0 | | | CL | Similar to above. TOP OF BEDROCK 90.5 FT | | | | | | | | | | |
| 90.5 | | | | | 90.5 | | Advanced roller bit 2.0 ft. Advanced 3.0 in. diameter casing to 94.0 ft. Begin rock core at 94.0 ft. | | | | | | | | | | |
| 95 | | | | | | | SEE CORE BORING REPORT FOR ROCK DETAILS | | | | | | | | | | |
| 100 | | | | | | | | | | | | | | | | | |

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. B100

CORE BORING REPORT

Boring No. B100
 File No. 27194-000
 Sheet No. 5 of 5

| Depth (ft) | Drilling Rate Min./ft | Run No. | Depth (ft) | Recovery/RQD | | Weath- ering | Well Dia- gram | Elev./ Depth (ft) | Visual Description and Remarks |
|---------------|-----------------------------|------------|---------------|--------------|----|-------------------|----------------------|-------------------------|--|
| | | | | in. | % | | | | |
| 95 | 6 | C1 | 94.0 | 45 | 75 | NO WELL INSTALLED | | 104.0 | SEE TEST BORING REPORT FOR OVERBURDEN DETAILS |
| | | | 99.0 | 14 | 23 | | | | C1: Soft to very soft, moderately weathered, blue gray, aphanitic ARGILLITE. Bedding extremely thin, high angle. Primary joint set parallel to bedding, very close, rough, planar, discolored, open. Secondary joint set perpendicular to bedding, high angle, rough, stepped, open, moderate. |
| | 4 | | | | | | | | -BEDROCK- |
| | 5 | | | | | | | | |
| | 6 | | | | | | | | |
| 100 | 7 | C2 | 99.0 | 55 | 92 | | | | C2: Similar to above except secondary joint set vertical. |
| | 5 | | 104.0 | 32 | 53 | | | | |
| | 5 | | | | | | | | |
| | 5 | | | | | | | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| | | | | | | | | | BOTTOM OF EXPLORATION 104.0 FT |

++A_CORE+WELL4

USCSLIB4.GLB

USCSB+CORE4.GDT

G:\27194\00027194\000TB.GPJ

Oct 17, '02

TEST BORING REPORT

Boring No. B101

Project CHARLES RIVER PLAZA ADDITION, CAMBRIDGE STREET, BOSTON, MA
 Client THE DAVIS COMPANIES
 Contractor GUILD DRILLING CO., INC.

File No. 27194-000
 Sheet No. 1 of 5
 Start September 26, 2002
 Finish October 1, 2002
 Driller K. Fisher
 H&A Rep. P. Pope

| | Casing | Sampler | Barrel | Drilling Equipment and Procedures |
|-----------------------|--------|---------|--------|--|
| Type | HW | S | NX | Rig Make & Model: Dietrich D-50 Truck |
| Inside Diameter (in.) | 4.0 | 1 3/8 | 2.0 | Bit Type: Roller Bit |
| Hammer Weight (lb.) | 300 | 140 | - | Drill Mud: None |
| Hammer Fall (in.) | 24 | 30 | - | Casing: PW spun 21.5/HW driven 24.0/NW spun 89.0 |
| | | | | Hoist/Hammer: Cat-Head Safety/Doughnut Hammer |

Elevation
 Datum
 Location See Plan

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | | Field Test | | | | |
|-------------|------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|------------|-----------|-----------|------------|--|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | |
| 0 | | | | | | | -ASPHALT- -CONCRETE- | | | | | | | | | | |
| | | | | | 0.3 | | | | | | | | | | | | |
| | | | | | 0.5 | | | | | | | | | | | | |
| | | | | | | | -VOID- (Ground Level of Parking Garage) | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | -CONCRETE- | | | | | | | | | | |
| | | | | | 10.5 | | | | | | | | | | | | |
| | | | | | 12.0 | | | | | | | | | | | | |
| 15 | | | | | | | -VOID- (First Sublevel of Parking Garage) | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | |

| Water Level Data | | | | | | Sample Identification | | Well Diagram | | Summary | |
|------------------|------|--------------------|------------------|----------------|-------|-----------------------|--------------------|--------------|----------------|---------|----------------------------|
| Date | Time | Elapsed Time (hr.) | Depth (ft.) to: | | | | | | | | |
| | | | Bottom of Casing | Bottom of Hole | Water | O | Open End Rod | | Riser Pipe | | Overburden (lin. ft.) 90.5 |
| | | | | | | T | Thin Wall Tube | | Screen | | Rock Cored (lin. ft.) 19.5 |
| | | | | | | U | Undisturbed Sample | | Filter Sand | | Samples S15, C4 |
| 9/26/02 | | | 10.5 | 10.5 | Dry | S | Split Spoon | | Cuttings | | |
| 9/27/02 | | | 24.0 | 74.0 | | G | Geoprobe | | Grout | | |
| 9/30/02 | | | | | | | | | Concrete | | |
| | | | | | | | | | Bentonite Seal | | |

Boring No. B101

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High
 Toughness: L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. **B101**

Boring No. **B101**

TEST BORING REPORT

Boring No. B101

File No. 27194-000

Sheet No. 4 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | | | Field Test | | |
|-------------|--------------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|------------|-----------|------------|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity |
| 80 | 38 44 76 100/5" | S13 8 | 79.0 80.9 | | | CL | Hard olive gray sandy lean CLAY (CL), mps 20 mm, no structure, no odor, moist. | | 5 | 10 | 10 | 10 | 65 | S | | H |
| 85 | 25 30 52 82 | S14 0 | 84.0 86.0 | | | | No recovery. | | | | | | | | | |
| | | | | | | | TOP OF BEDROCK 87.5 FT | | | | | | | | | |
| | | | | | 87.5 | ML | Hard blue gray SILT (ML), mps 0.1 mm, no structure, no odor, moist. Sample consists of decomposed bedrock. | | | | | 5 | 95 | N | L | N |
| | | | | | | | -BEDROCK- | | | | | | | | | |
| 90 | 40 60 100/3" | S15 8 | 89.0 90.3 | | | | SEE CORE BORING REPORT FOR ROCK DETAILS | | | | | | | | | |
| 95 | | | | | | | | | | | | | | | | |
| 100 | | | | | | | | | | | | | | | | |
| 105 | | | | | | | | | | | | | | | | |

USCS_TB4 USCSTB+CORE4.GDT G:\27194\000\27194000TB.GPJ Od 17. 02

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No.

B101

CORE BORING REPORT

Boring No. B101

File No. 27194-000

Sheet No. 5 of 5

| Depth (ft) | Drilling Rate Min./ft | Run No. | Depth (ft) | Recovery/RQD | | Weath- ering | Well Dia- gram | Elev./ Depth (ft) | Visual Description and Remarks |
|---------------|-----------------------------|------------|---------------|--------------|----|-----------------|----------------------|-------------------------|---|
| | | | | in. | % | | | | |
| | | | | | | | | | SEE TEST BORING REPORT FOR OVERBURDEN DETAILS |
| | | | | | | | | | Spun 3.0 casing to 89.0 ft. Advanced roller bit to 91.0 ft. Begin rock cor at 91.0 ft. |
| 2 | | C1 | 90.5 | 45 | 83 | | | 90.5 | C1: Very soft, moderately weathered, blue gray, aphanitic ARGILLITE. |
| 4 | | | 95.0 | 7 | 13 | | | | Bedding extremely thin, high angle. Joint sets difficult to determine because of the poor quality of rock. |
| 3 | | | | | | | | | -BEDROCK- |
| 5 | | | | | | | | | |
| 4 | | | | | | | | | |
| 95 | | | | | | | | | |
| 3 | | C2 | 95.0 | 45 | 75 | | | | C2: Similar to above. |
| | | | 100.0 | 0 | 0 | | | | |
| 4 | | | | | | | | | |
| 4 | | | | | | | | | |
| 4 | | | | | | | | | |
| 4 | | | | | | | | | |
| 100 | | | | | | | | | |
| 3 | | C3 | 100.0 | 47 | 78 | | | | C3: Similar to above. |
| | | | 105.0 | 10 | 17 | | | | |
| 3 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 105 | | | | | | | | | |
| 4 | | C4 | 105.0 | 55 | 92 | | | | C4: Similar to C1 except primary joint set parallel to bedding, close, rough, planar, discolored, open. Secondary joint set vertical, moderate, rough, stepped, discolored, open. |
| | | | 110.0 | 36 | 60 | | | | |
| 4 | | | | | | | | | |
| 4 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 110 | | | | | | | | 110.0 | BOTTOM OF EXPLORATION 110.0 FT |

H-A_CORE+WELL4 USCSTB+CORE4 GDT G-2719400027194000TE.GPJ Oct 17, 02

NO WELL INSTALLED

TEST BORING REPORT

Boring No. B102

File No. 27194-000

Sheet No. 2 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | | | | | Sand | | | Field Test | | |
|-------------|----------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|-----------|-----------|------------|------------|--|--|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | | | |
| 20 | | | | | | | | | | | | | | | | | | | |
| | 8 13 24 16 | S1 2 | 21.0 23.0 | | 21.0 | GP | Dense brown poorly graded GRAVEL with sand (GP), mps 20 mm, no structure, no odor, wet. -FILL- | 80 | 5 | 5 | 5 | 5 | | R | | | | | |
| | | | | | 23.0 | | | | | | | | | | | | | | |
| 25 | 11 12 13 17 | S2 20 | 24.5 26.5 | | | CL | Very stiff olive brown lean CLAY (CL), mps < 0.05 mm, stratified, occasional fine silt partings, no odor, wet. -MARINE DEPOSIT- | | | | | | 100 | N | H | H | | | |
| | | | | | | | | | | | | | | | | | | | |
| 30 | 3 3 4 5 | S3 24 | 29.0 31.0 | | | | Similar to above except medium stiff. | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 35 | 1 2 3 4 | S4 16 | 34.0 36.0 | | | CL | Medium stiff olive brown lean CLAY (CL), mps < 0.05 mm, occasional silt partings, no odor, wet. | | | | | | 100 | N | H | H | | | |
| | | | | | | | | | | | | | | | | | | | |
| 40 | WOH 2 3 4 | S5 24 | 39.0 41.0 | | | CL | Similar to above except medium stiff. | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 45 | WOH 2 2 3 | S6 24 | 44.0 46.0 | | | CL | Similar to above except soft. | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | 2 | S7 | 49.0 | | | CL | Similar to above. | | | | | | | | | | | | |

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. B102

TEST BORING REPORT

Boring No. B102

File No. 27194-000

Sheet No. 3 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | Fines | | Field Test | | |
|-------------|----------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|------------|-----------|------------|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity |
| 50 | 3 2 3 | 20 | 51.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 55 | 3 2 5 6 | S8 24 | 54.0 56.0 | | | CL | Similar to above. -MARINE DEPOSIT- | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 60 | 2 3 4 7 | S9 20 | 59.0 61.0 | | | CL | Similar to above. | | | | | | | | | |
| | | | | | 61.0 | | Note: Cobbles at 61.5 ft. | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 65 | 5 7 10 8 | S10 10 | 64.0 66.0 | | | CL | Very stiff olive brown lean CLAY (CL), mps 44 in., laminated, no odor, wet. Note: Pushing gravel piece. | | | | | | | | | |
| | | | | | | | -MARINE DEPOSIT- | | | | | | | | | |
| | | | | | 67.0 | | Note: Cobbles at 67.0 ft. | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 70 | 45 27 42 17 | S11 8 | 69.0 71.0 | | | GP | Very dense olive brown poorly graded GRAVEL with sand (GP), mps 40 mm, no structure, no odor, wet. -GLACIOFLUVIAL DEPOSITS- | 30 | 50 | 5 | 5 | 5 | 5 | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | 71.5 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| 75 | 28 22 16 24 | S12 12 | 74.0 76.0 | | | CL | Hard olive brown lean CLAY (CL), mps < 0.05 mm, occasional sand seams, no odor, wet. -GLACIOMARINE DEPOSITS- | | | | | | | 100 | N | H H |
| | | | | | | | | | | | | | | | | |

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. B102

TEST BORING REPORT

Boring No. B102

File No. 27194-000

Sheet No. 4 of 5

| Depth (ft.) | SPT ¹ | Sample No. & Rec. (in.) | Sample Depth (ft.) | Well Diagram | Elev./Depth (ft.) | USCS Symbol | Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size ² , structure, odor, moisture, optional descriptions, geologic interpretation) | Gravel | | Sand | | Fines | | Field Test | | | |
|-------------|------------------|-------------------------|--------------------|--------------|-------------------|-------------|---|----------|--------|----------|----------|--------|---------|------------|-----------|------------|----------|
| | | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | Strength |
| 80 | 27 | S13 | 79.0 | | 79.5 | CL | Hard olive brown lean CLAY with gravel (CL), mps 20 mm, no structure, no odor, wet. Sample consists mainly of glacial till. Coarse fraction is Argillite fragments that are highly weathered. -GLACIOMARINE DEPOSITS- Similar to above. | | 15 | 5 | | 5 | 75 | N | H | H | F |
| | 67 | 6 | 79.5 | | | | | | | | | | | | | | |
| | 100(6) | S13A | 79.5 | | | | | | | | | | | | | | |
| | | 12 | 80.5 | | | | | | | | | | | | | | |
| 85 | 21 | S14 | 84.0 | | 87.0 | | Very hard blue gray poorly graded GRAVEL (GP), mps 20 mm, bedding, no odor, wet. Sample consists of highly weathered Argillite pieces. -DECOMPOSED BEDROCK- SEE CORE BORING REPORT FOR ROCK DETAILS | | | | | | | | | | |
| | 32 | 14 | 86.0 | | | | | | | | | | | | | | |
| | 30 | | | | | | | | | | | | | | | | |
| | 67 | | | | | | | | | | | | | | | | |
| 90 | | | | | 87.0 | | Very hard blue gray poorly graded GRAVEL (GP), mps 20 mm, bedding, no odor, wet. Sample consists of highly weathered Argillite pieces. -DECOMPOSED BEDROCK- SEE CORE BORING REPORT FOR ROCK DETAILS | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 95 | | | | | 87.0 | | Very hard blue gray poorly graded GRAVEL (GP), mps 20 mm, bedding, no odor, wet. Sample consists of highly weathered Argillite pieces. -DECOMPOSED BEDROCK- SEE CORE BORING REPORT FOR ROCK DETAILS | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

¹SPT = Sampler blows per 6 in. ²Maximum particle size (mm) is determined by direct observation within the limitations of sampler

S1726

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No.

B102

CORE BORING REPORT

Boring No. B102

File No. 27194-000

Sheet No. 5 of 5

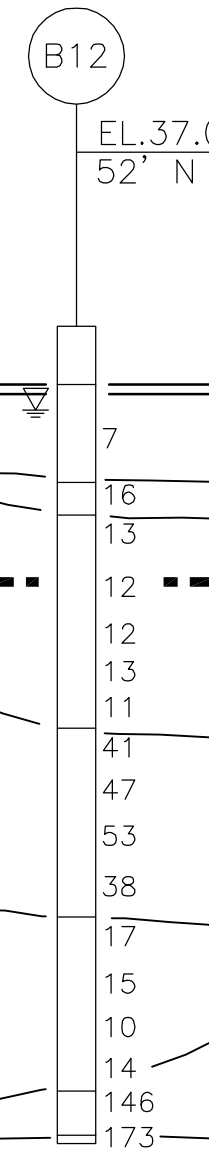
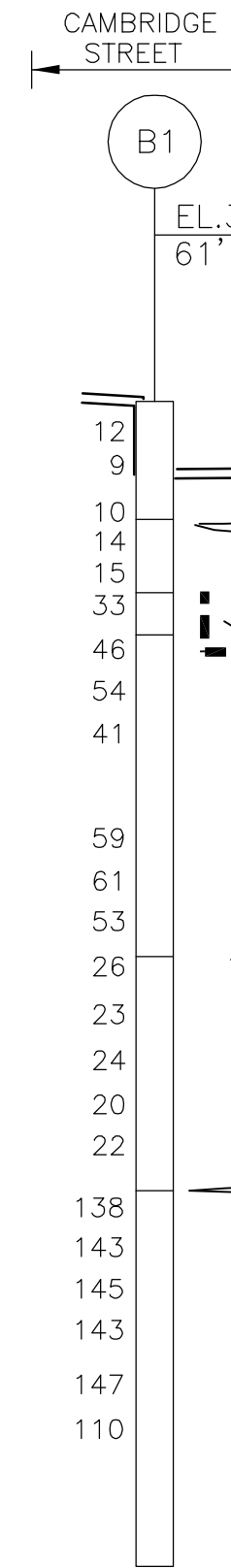
| Depth (ft) | Drilling Rate Min./ft | Run No. | Depth (ft) | Recovery/RQD | | Weath- ering | Well Dia- gram | Elev./ Depth (ft) | Visual Description and Remarks |
|-------------------|-----------------------------|------------|---------------|--------------|----------|-----------------|----------------------|-------------------------|--|
| | | | | in. | % | | | | |
| | | | | | | | | | SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK 87.0 FT |
| 90 | 6 | C1 | 90.0 94.5 | 38 9 | 70 17 | | | 90.0 | -BEDROCK- C1: Soft to very soft, moderately weathered, blue gray, aphanitic ARGILLITE. Bedding extremely thin, high angle. Primary joint set parallel to bedding, high angle, very close, smooth, planar, discolored, open. Secondary joint set high angle, close, rough, planar, fresh, open. Note: Sections of core are of a peanut butter consistency. |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| | 10 | | | | | | | | |
| 95 | | C2 | 94.5 99.5 | 58 39 | 97 65 | | | | C2: Similar to above except no peanut butter sections. |
| | 4 | | | | | | | | -BEDROCK- |
| | 5 | | | | | | | | |
| | 4 | | | | | | | | |
| | 4 | | | | | | | | |
| | 5 | | | | | | | | |
| | | | | | | | | 99.5 | BOTTOM OF EXPLORATION 99.5 FT |
| NO WELL INSTALLED | | | | | | | | | |

USCSTB-CORE4.GDT

G:\27194\00027194\0001B.GPJ

08/17/02

ELEVATION IN FEET (BCB)



STAIRS

STAIRS

BRICK PLAZA

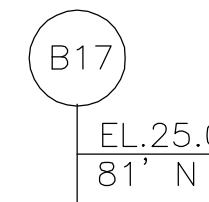
MISCELLANEOUS FILL

MARINE SAND

MARINE CLAY

GLACIAL TILL

BEDROCK



MBTA GREEN LINE VENT G-5

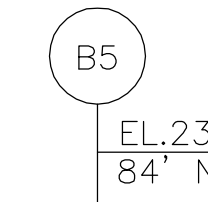
MISCELLANEOUS FILL

MARINE SAND

MARINE CLAY

GLACIAL TILL

BEDROCK



MBTA GREEN LINE VENT G-3/G-4

PROPOSED GARAGE

EXISTING JFK BUILDING PRESSURE SLAB

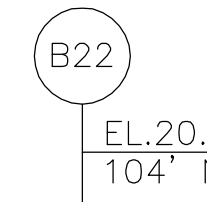
MISCELLANEOUS FILL

MARINE CLAY

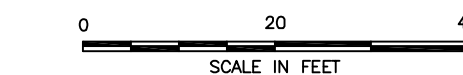
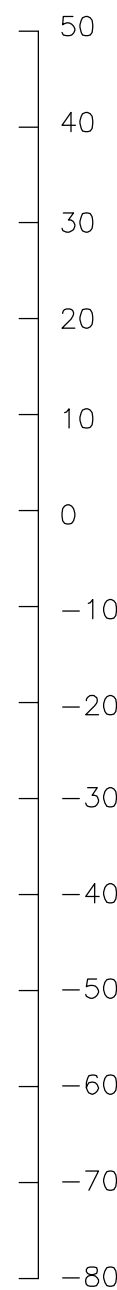
GLACIOMARINE

GLACIAL TILL

BEDROCK



ELEVATION IN FEET (BCB)



CITY HALL PLAZA DEVELOPMENT
BOSTON, MASSACHUSETTS

SECTION C-C

SCALE: AS SHOWN

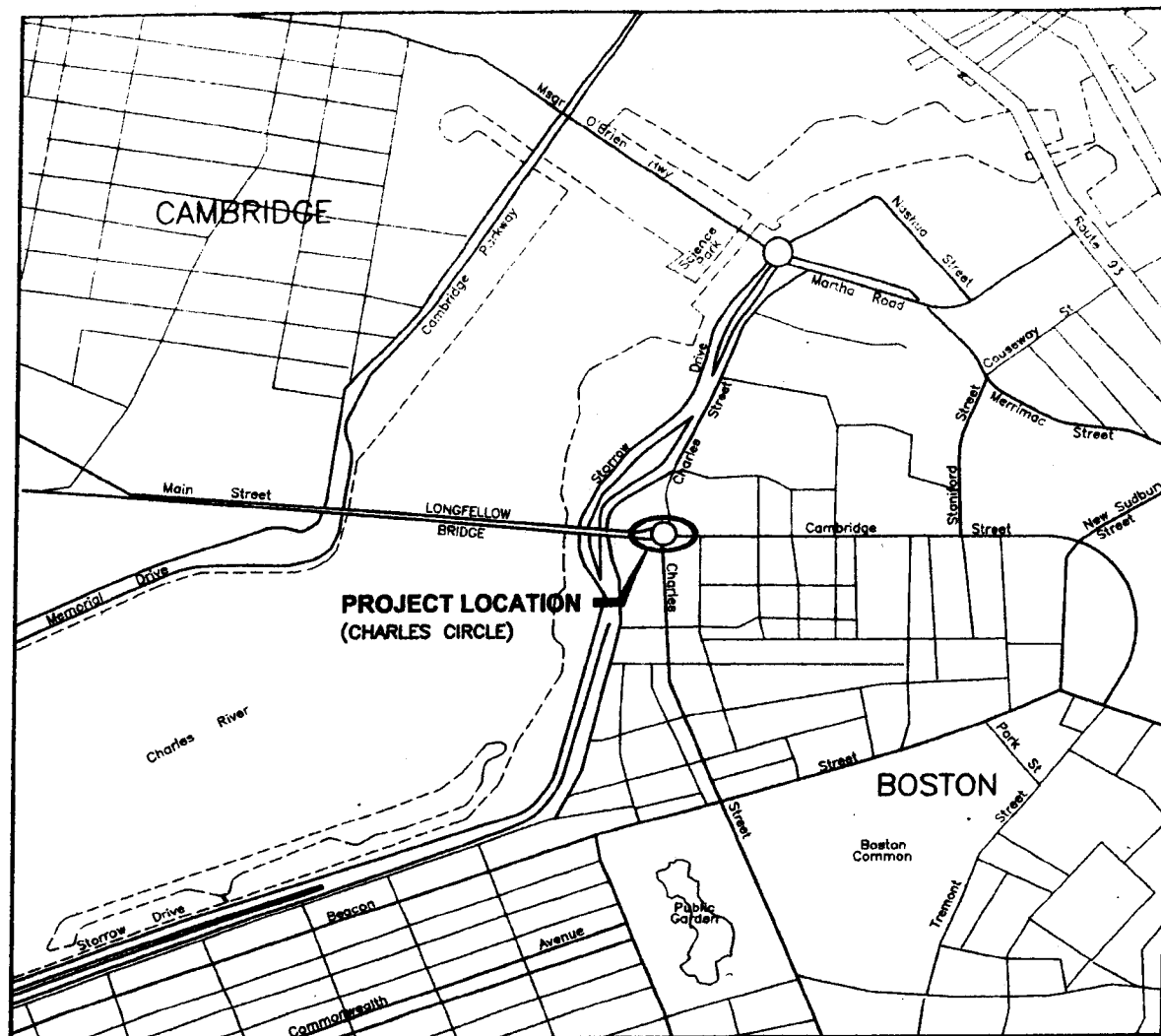
NOVEMBER 1996

FIGURE 4

APPENDIX B

Foundation Plans for the Charles/MGH Red Line Station

From: Construction Drawings (2002). “Charles/MGH Station, Red Line Accessibility and Modernization Project,” MBTA Contract No. A41CN01.



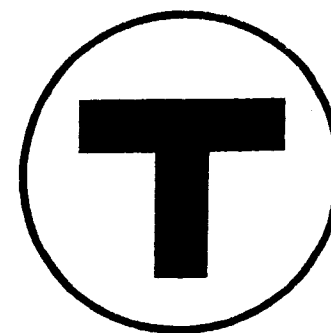
LOCATION PLAN

ELKUS/MANFREDI ARCHITECTS —
HDR ENGINEERING JOINT VENTURE, LLC

530 ATLANTIC AVENUE
BOSTON, MASSACHUSETTS 02210

IN ASSOCIATION WITH:

R. D. KIMBALL COMPANY, INC.
BROWN AND ROWE, INC.
LIM CONSULTANTS, INC.
HOWE SURVEYING ASSOCIATES, INC.
HNTB CORPORATION
KEVILLE ENTERPRISES, INC.
GEI CONSULTANTS, INC.
KM CHNG ENVIRONMENTAL, INC.
MCM/McMAHON ASSOCIATES, INC.



MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY

CHARLES/MGH STATION RED LINE ACCESSIBILITY AND MODERNIZATION PROJECT

MBTA CONTRACT NO. A41CN01

Volume 2 of 2

DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION
CAPITAL GRANT CONTRACT
PROJECT NO: FTA FORMULA FUNDING (TBD)

Plan No.'s 142147-142468

APPROVALS:

David W. Ryan 6-13-02
Date:
Assistant General Manager for Design and Construction

Barbara Boylan 6-12-02
Date:
Barbara Boylan, AIA
Director of Design

Michael Stoffel 6-13-02
Date:
Michael Stoffel
Chief of Engineering and Construction

GENERAL

- G1 WORK SHALL CONFORM TO THE REQUIREMENTS OF THE COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE, 6TH EDITION, 1997.
- G2 CONTRACTOR SHALL EXAMINE ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR VERIFICATION OF LOCATION AND DIMENSIONS OF CHASES, INSERTS, OPENINGS, SLEEVES, WASHES, DRIPS, REVEALS, DEPRESSIONS, AND OTHER PROJECT REQUIREMENTS NOT SHOWN ON STRUCTURAL DRAWINGS.
- G3 CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE JOB.
- G4 OPENINGS IN SLABS AND WALLS LESS THAN 12 INCHES IN DIAMETER ARE GENERALLY NOT SHOWN. OPENINGS SHOWN ON STRUCTURAL DRAWINGS SHALL NOT BE REVISED WITHOUT PRIOR WRITTEN APPROVAL OF THE DESIGN STRUCTURAL ENGINEER.
- G5 OPENINGS IN SLABS, WALLS AND ROOF SLABS IN ADDITION TO THOSE SHOWN ON STRUCTURAL DRAWINGS SHALL BE INCORPORATED IN THE WORK AS REQUIRED BY THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING CONTRACT DOCUMENTS.
- G6 FOR INSERTS AND DETAILS FOR ELEVATOR EQUIPMENT SEE ARCHITECTURAL AND ELEVATOR MANUFACTURER'S DRAWINGS.
- G7 DETAILS NOT SPECIFICALLY SHOWN SHALL BE SIMILAR TO THOSE SHOWN FOR THE MOST NEARLY SIMILAR SITUATION AS DETERMINED BY THE DESIGN STRUCTURAL ENGINEER.
- G8 UNLESS SHOWN, NOTED OR REQUIRED ELSEWHERE IN CONTRACT DOCUMENTS, REQUIREMENTS NOTED BELOW SHALL APPLY.

FOUNDATIONS

- F1 NEW FOUNDATIONS SHALL CONSIST OF 8 INCH DIAMETER DRILLED MINI PILES HAVING A MINIMUM AXIAL DESIGN CAPACITY (COMPRESSION AND TENSION) OF 50 TONS IN ACCORDANCE WITH THE CURRENT PROVISIONS OF THE MASSACHUSETTS STATE BUILDING CODE.
- F2 THE CONTRACTOR SHALL INCLUDE IN HIS BID THE INSTALLATION OF TWO (2) GROUNDWATER OBSERVATION WELLS INSTALLED TO A DEPTH OF 20 FEET. EACH WELL SHALL BE INSTALLED AND READ PRIOR TO ANY OTHER CONSTRUCTION ACTIVITY AT THE SITE. SHOULD THE GROUNDWATER IN THE AREA OF THE SITE BE DEPRESSED MORE THAN 2 FEET FROM THE PRE-CONSTRUCTION LEVEL, THE CONTRACTOR SHALL INSTALL AND OPERATE A GROUNDWATER RECHARGE SYSTEM CAPABLE OF MAINTAINING THE GROUNDWATER AT THE PRECONSTRUCTION LEVEL AT ALL TIMES.
- F3 THE CONTRACTOR SHALL RETAIN A REGISTERED PROFESSIONAL ENGINEER TO DESIGN A LATERAL EARTH SUPPORT SYSTEM OF SUFFICIENT CAPACITY TO SUPPORT THE ADJACENT SOIL, STRUCTURES, STREETS, AND UTILITIES AT ALL TIMES DURING THE COURSE OF THE WORK. THE CONTRACTOR SHALL SEQUENCE THE INSTALLATION AND REMOVAL OF THE LATERAL EARTH SUPPORT SYSTEM SO AS NOT TO DELAY OR INTERFERE IN ANY WAY WITH THE COMPLETED STRUCTURE.
- F4 DRILLED PILES SHALL BE INSTALLED WITHIN A PLAN LOCATION TOLERANCE OF 3 INCHES FOR GROUPS OF 3 OR MORE AND 1.5 INCHES FOR ONE-PILE AND TWO-PILE UNITS. TOPS SHALL BE WITHIN 1 INCH OF THE CUT-OFF ELEVATIONS INDICATED ON DRAWINGS.
- F5 INSTALL PILES ONLY IN THE PRESENCE OF THE SOIL ENGINEER REPRESENTATIVE.
- F6 PROVIDE ALL DEWATERING AS REQUIRED TO ENSURE THAT NO FOUNDATION CONCRETE INCLUDING PILE CAPS SHALL BE PLACED IN WATER OR ON FROZEN GROUND.
- F7 UNLESS OTHERWISE NOTED, FOUNDATION UNITS SHALL BE CENTERED UNDER SUPPORTED MEMBERS.
- F8 MAINTAIN ALL EXCAVATIONS IN A DRY CONDITION BY SUMPING AS REQUIRED.

CONCRETE

- C1 CONCRETE WORK SHALL CONFORM TO BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-95) AND SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS (ACI 301-95), BOTH AS IN FORCE AND EFFECT ON THE EFFECTIVE DATE OF THE MASSACHUSETTS STATE BUILDING CODE, 6TH EDITION, 1997.
- C2 CONCRETE SHALL BE CONTROLLED CONCRETE, PROPORTIONED, MIXED AND PLACED UNDER THE SUPERVISION OF AN APPROVED CONCRETE TESTING AGENCY.
- C3 CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI.
- C4 ALL CONCRETE SHALL BE NORMALWEIGHT CONCRETE WITH A NOMINAL DRY DENSITY OF 145 PCF.
- C5 CONCRETE TO BE EXPOSED TO THE WEATHER IN THE FINISHED PROJECT SHALL BE AIR-ENTRAINED. SEE SPECIFICATIONS.
- C6 THE USE OF CONSTRUCTION JOINTS WHERE SHOWN ON THE DRAWINGS IS MANDATORY. OMISSIONS, ADDITIONS OR CHANGES SHALL NOT BE MADE EXCEPT WITH THE SUBMISSION OF A WRITTEN REQUEST TOGETHER WITH DRAWINGS OF THE PROPOSED JOINT LOCATIONS FOR APPROVAL OF THE DESIGN STRUCTURAL ENGINEER.
- C7 WHERE CONSTRUCTION JOINTS ARE NOT SHOWN, DRAWINGS SHOWING LOCATION OF CONSTRUCTION JOINTS AND CONCRETE PLACING SEQUENCE SHALL BE SUBMITTED TO THE DESIGN STRUCTURAL ENGINEER FOR APPROVAL PRIOR TO PREPARATION OF THE REINFORCEMENT SHOP DRAWINGS.
- C8 SIZE OF CONCRETE PLACEMENTS UNLESS OTHERWISE SHOWN SHALL BE AS FOLLOWS:

| | MAXIMUM LENGTH | MAXIMUM AREA |
|----------------------------|----------------|--------------|
| A.) FRAMED SLABS | 40 FEET | 1600 SQ. FT. |
| B.) WALLS | 30 FEET | |
| C.) CONCRETE ON STEEL DECK | 60 FEET | 3600 SQ. FT. |
| D.) BEAMS | 60 FEET | 3600 SQ. FT. |

- C9 CONCRETE SLABS SHALL BE CAST SO THAT THE SLAB THICKNESS IS AT NO POINT LESS THAN THAT INDICATED ON THE DRAWINGS.
- C10 CONCRETE SLABS AND BEAMS SHALL BE CAST ALTERNATIVELY SO THAT ADJACENT SECTIONS ARE PLACED NO SOONER THAN THREE DAYS APART.
- C11 CONCRETE SHALL BE PLACED WITHOUT HORIZONTAL CONSTRUCTION JOINTS EXCEPT WHERE SHOWN OR NOTED. VERTICAL CONSTRUCTION JOINTS AND STOPS IN CONCRETE WORK SHALL BE MADE AT MIDSPAN OR AT POINTS OF MINIMUM SHEAR.
- C12 STRUCTURAL STEEL BELOW GRADE SHALL BE ENCASED IN CONCRETE FOR RUST PROTECTION. COVER SHALL BE 2 INCH MINIMUM.
- C13 CONDUITS AND PIPES SHALL NOT BE PERMITTED TO BE EMBEDDED IN THE CONCRETE SLAB.

PRESTRESSED CONCRETE

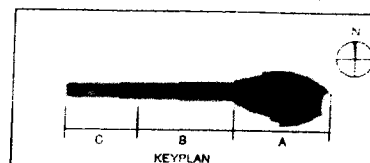
- PC1 FLOOR CONSTRUCTION SHALL BE 4" MIN. THICK CONCRETE TOPPING ON 6" (NOMINAL) DEEP PRECAST, PRESTRESSED CONCRETE SLABS SPANNING TO STRUCTURAL STEEL BEAMS.
- PC2 FLOOR DECKS SHALL BE SLOPED FOR DRAINAGE.
- PC3 PROVIDE DETAILED PRESTRESSED CONCRETE AND CONNECTION DESIGN IN ACCORDANCE WITH ALL APPLICABLE CODES. LATERAL SYSTEMS DESIGN INTERFACE WITH CAST-IN-PLACE WORK SHALL BE DESIGNED FOR FORCES ILLUSTRATED IN LOAD PATH DIAGRAM.
- PC4 SUBMIT DETAILED PRESTRESSED CONCRETE AND CONNECTION DESIGN CALCULATIONS PRIOR TO PRECAST MEMBERS SHOP DRAWING SUBMISSION.
- PC5 FABRICATION, TRANSPORTATION AND ERECTION OF PRESTRESSED MEMBERS SHALL CONFORM TO THE LATEST "PRESTRESSED CONCRETE INSTITUTE" STANDARDS FOR PRESTRESSED CONCRETE PLANTS, IN ADDITION TO THE PROVISIONS GIVEN HEREIN.
- PC6 PRESTRESSED PRECAST SLAB FABRICATOR SHALL PROVIDE COMPLETE DESIGN FOR ALL "SLABS" FOR THE LOADS INDICATED ON PLANS. DESIGN COMPUTATIONS SHALL BE SUBMITTED TO THE DESIGN STRUCTURAL ENGINEER FOR APPROVAL.
- PC7 PRECAST PRESTRESSED CONCRETE SLAB DESIGN LOADS:
- SUPERIMPOSED DEAD LOAD.
 - SNOW LOAD - MASSACHUSETTS STATE BUILDING CODE 30 PSF PLUS DRIFT.
 - LIVE LOAD - 100 PSF
 - FLOOR DIAPHRAGM LOAD
 - SEISMIC TENSILE AND COMPRESSIVE "DRAG-STRUT" LOADS
 - THERMAL AND MOISTURE VOLUME EFFECTS.
- PC8 CAMBER SLABS SO THAT A MINIMUM 1" OF CAMBER WILL REMAIN AFTER FULL LOADING AND AFTER ALL LOSSES HAVE OCCURRED.
- PC9 CONNECTION DETAILS ARE NOT EXCLUSIVE AND MAY BE ALTERED BY MANUFACTURER TO SUIT HIS STANDARD OF SUGGESTED DETAILS, PROVIDED THAT THESE STANDARDS SATISFY THE STRENGTH REQUIREMENTS OF THE PARTICULAR CONNECTION AND ARE SUBJECTED TO THE DESIGN STRUCTURAL ENGINEER'S APPROVAL PRIOR TO CASTING.
- PC10 THE ERECTION CONTRACTOR SHALL SUBMIT HIS PLAN FOR ERECTION AND BRACING OF PRECAST MEMBERS TO THE ENGINEER AND TO THE MBTA AND SHALL COORDINATE SUCH WORK WITH THE GENERAL CONTRACTOR. ALL SUCH PLANS SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER AND THE DESIGN STRUCTURAL ENGINEER. HE SHALL PROVIDE AND BE RESPONSIBLE FOR NECESSARY ERECTION BRACING AND GUYING OF THE PRECAST MEMBERS UNTIL ALL FINAL CONNECTIONS HAVE BEEN MADE.
- PC11 MEMBERS SHALL BE LIFTED ONLY AT BEARING POINTS IN COMPLETED STRUCTURE.
- PC12 LIFTING AND HANDLING INSERTS SHALL BE DESIGNED FOR 100% IMPACT.
- PC13 THE PRECASTING CONTRACTOR SHALL FURNISH AND INSTALL INSERTS, ANCHORS, REGLETS, DOVETAIL ANCHOR SLOTS, WELDED PLATES, ETC., REQUIRED TO BE CAST INTO HIS UNITS, AND SHALL SHOW SAME ON THE SHOP DRAWINGS.
- PC14 WELDED CONNECTIONS SHALL BE DONE BY CERTIFIED WELDERS.
- PC15 POWDER ACTUATED FASTENERS SHALL NOT BE USED FOR ATTACHMENT PURPOSES. EXPANSION TYPE INSERTS SHALL BE DRILLED.
- PC16 OPENINGS SHALL BE SHOWN ON THE PRECASTING FABRICATOR'S SHOP DRAWINGS. THESE OPENINGS MAY BE PLANT CAST OR CUT IN THE FIELD AFTER ERECTION BY THE PRECASTING FABRICATOR. TECHNIQUES FOR FIELD CUTTING SHALL BE APPROVED BY THE DESIGN STRUCTURAL ENGINEER. HOLES THAT ARE TO BE FORMED BY DRILLING THROUGH THE TOPPING FROM ABOVE SHALL BE WEDGED AND SHORED FROM BELOW TO PREVENT SPALLING.
- PC17 ALL FIELD WELDS SHALL BE COATED WITH ZINC RICH PAINT.

PRESTRESSING

- PS1 DETAILED SHOP DRAWINGS SHALL BE SUBMITTED TO THE DESIGN STRUCTURAL ENGINEER FOR CHECKING AND APPROVAL BEFORE FABRICATION OF PRESTRESSED CONCRETE. THE SHOP DRAWINGS SHALL DESCRIBE THE PRE-STRESSING, SHOWING PROFILES OF TENDONS, TENDON STRESSING DATA, AND MARKING AND PLACEMENT OF THE TENDONS IN CONCRETE MEMBERS.
- PS2 THE STRESSING OPERATION SHALL NOT BEGIN UNTIL THE CONCRETE HAS REACHED THE REQUIRED COMPRESSIVE STRENGTH, IN ACCORDANCE WITH PCI.
- PS3 PRESTRESSED MEMBERS SHALL HAVE A MINIMUM 28 DAY ULTIMATE STRENGTH OF 5000 PSI.
- PS4 THE STRENGTH OF CONCRETE AT TRANSFER (F'ci) SHALL BE AT LEAST 3750 PSI.
- PS5 THE CONTRACTOR SHALL PROVIDE LIFTING DEVICES LOCATED IN THE MEMBER ONLY IN REGIONS WHERE THE MEMBER IS TO BE PERMANENTLY SUPPORTED.
- PS6 SHOP DRAWINGS SHOWING ALL INSERTS AND OPENINGS SHALL BE APPROVED BEFORE FABRICATION. OPENINGS LARGER THAN 12" X 12" ARE SHOWN ON THE STRUCTURAL DRAWINGS. OPENINGS SMALLER THAN 12" X 12" (I.E. PLUMBING SLEEVES) HAVE NOT BEEN SHOWN, BUT MUST BE SHOWN ON THE SHOP DRAWING SO THAT THERE WILL BE NO INTERFERENCE WITH STRAND OR REINFORCING. FIELD DRILLING OF PRESTRESSED MEMBERS WILL NOT BE PERMITTED EXCEPT FOR SMALL ANCHORS REQUIRING A HOLE NO LONGER THAN 1 INCH DEEP.

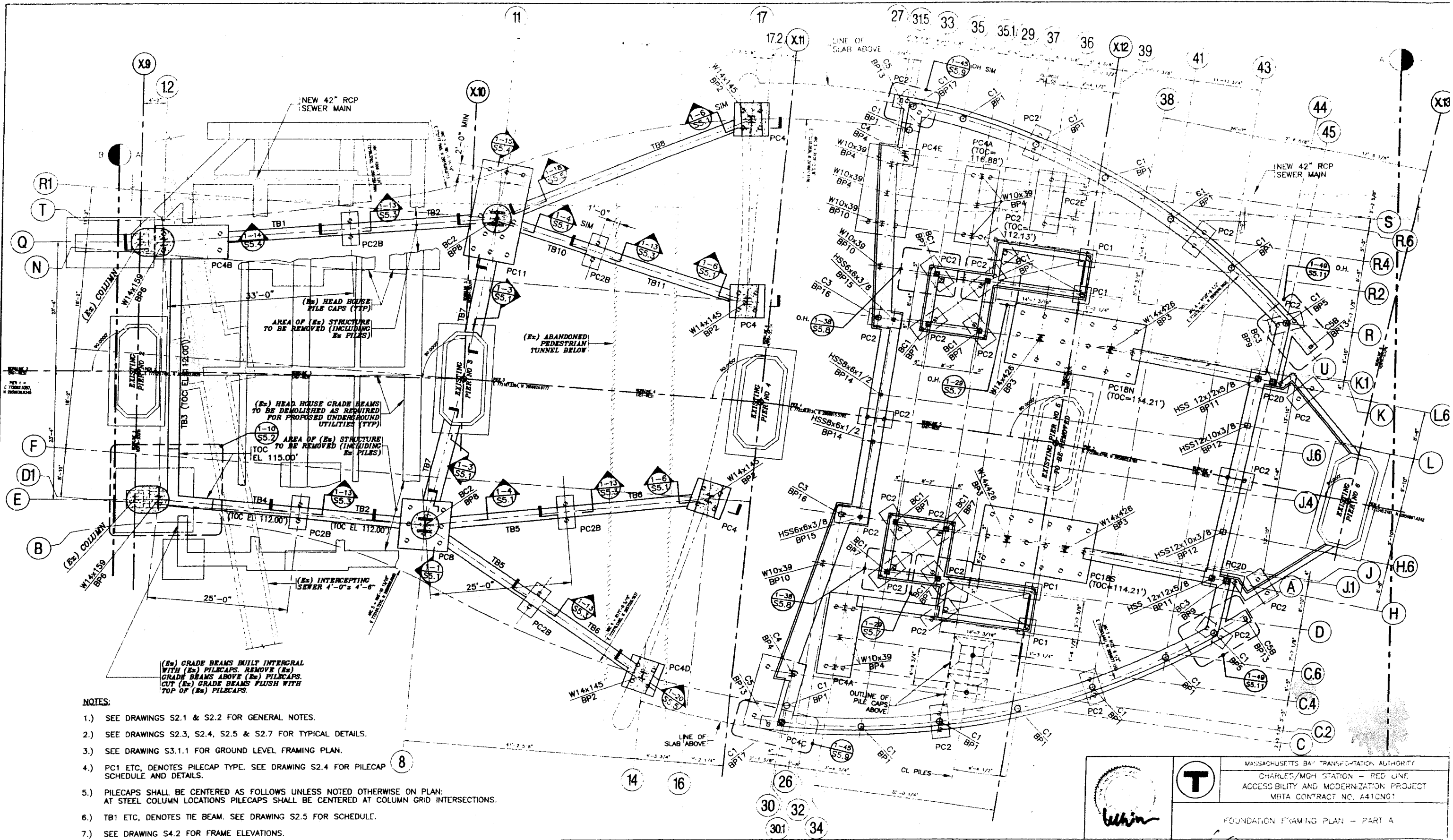
REINFORCEMENT

- R1 DETAILING, FABRICATION, AND ERECTION OF REINFORCEMENT, UNLESS OTHERWISE NOTED, SHALL CONFORM TO THE LATEST EDITIONS OF ACI "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318)" AND ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES (ACI-315)".
- R2 STEEL REINFORCEMENT SHALL CONFORM TO ASTM 615 GRADE 60 (YIELD STRESS = 60,000 PSI) AND SHALL BE EPOXY COATED UNLESS NOTED OTHERWISE.
- R3 WELDED WIRE FABRIC REINFORCEMENT: ASTM A185.
- PROVIDE WWF 2 X 2 - W1.4 X W1.4 (GALVANIZED) IN MIDDLE OF CONCRETE FILL FOR STAIRS.
 - PROVIDE WWF 4 X 4 - W1.4 X W1.4 (GALVANIZED) AROUND ALL STRUCTURAL STEEL MEMBERS TO BE ENCASED IN CONCRETE, UNLESS NOTED OTHERWISE.
- R4 PROVIDE AND SCHEDULE ON SHOP DRAWINGS, ALL NECESSARY ACCESSORIES TO HOLD REINFORCEMENT SECURELY IN POSITION. MINIMUM REQUIREMENTS SHALL BE: HIGH CHAIRS, 3'-0" ON CENTER #5 SUPPORT BAR ON HIGH CHAIRS; SLAB BOLSTERS, 3'-0" ON CENTER. BRICKS OR CEMENT BLOCKS SHALL NOT BE USED AS CHAIR SUBSTITUTIONS.
- R5 MINIMUM CONCRETE COVER FOR REINFORCEMENT UNLESS OTHERWISE NOTED SHALL BE AS FOLLOWS:
- UNFORMED SURFACES IN CONTACT WITH GROUND OR EXPOSED TO WEATHER (PILECAPS, GRADE BEAMS, FRAMED SLABS).....3 INCHES
 - FORMED SURFACES IN CONTACT WITH GROUND OR EXPOSED TO WEATHER (WALLS).....2 INCHES
 - EXTERIOR SLABS.....2 INCHES
 - CLEARANCE TO STIRRUPS OF BEAMS.....1 1/2 INCHES
- MAXIMUM DEVIATION FROM THESE REQUIREMENTS SHALL BE 1/4 INCH FOR SECTIONS 10 INCHES THICK OR LESS; AND 1/2 INCH FOR SECTIONS OVER 10 INCHES THICK.
- R6 WHERE CONTINUOUS BARS ARE CALLED FOR, THEY SHALL BE RUN CONTINUOUSLY AROUND CORNERS AND LAPPED AT NECESSARY SPLICES OR HOOKED AT DISCONTINUOUS ENDS. LAPS SHALL BE CLASS C TENSION LAP SPLICE, UNLESS OTHERWISE SHOWN.
- R7 WHERE REINFORCEMENT IS NOT SHOWN ON DRAWINGS PROVIDE REINFORCEMENT IN ACCORDANCE WITH APPLICABLE TYPICAL DETAILS FOR MOST NEARLY SIMILAR SITUATIONS, AS DETERMINED BY THE DESIGN STRUCTURAL ENGINEER. IN NO CASE SHALL REINFORCEMENT BE LESS THAN THE APPLICABLE CODES.
- R8 WHERE REINFORCEMENT IS CALLED FOR IN SECTION, REINFORCEMENT IS CONSIDERED TYPICAL WHEREVER THE SECTION APPLIES.
- R9 REINFORCEMENT SHALL BE CONTINUOUS THROUGH ALL CONSTRUCTION JOINTS UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
- R10 WELDED WIRE FABRIC SHALL LAP 6 INCHES OR ONE SPACING PLUS 2 INCHES, WHICHEVER IS LARGER, AND SHALL BE WIRED TOGETHER.
- R11 INSTALLATION OF REINFORCEMENT SHALL BE COMPLETED AT LEAST 24 HOURS PRIOR TO SCHEDULED CONCRETE PLACEMENT. NOTIFY DESIGN STRUCTURAL ENGINEER OR HIS DESIGNATE OF COMPLETION AT LEAST 48 HOURS PRIOR TO SCHEDULED COMPLETION OF PLACEMENT OF REINFORCEMENT.



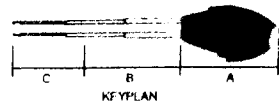
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| | | | | MASSACHUSETTS BAY TRANSPORTATION AUTHORITY CHARLES/MGH STATION - RED LINE ACCESSIBILITY AND MODERNIZATION PROJECT MBTA CONTRACT NO. A410N61 | |
| GENERAL NOTES (1 OF 2) | | | | | |
| | | | | PLAN 142310 | |

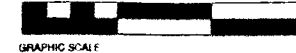


NOTES:

- SEE DRAWINGS S2.1 & S2.2 FOR GENERAL NOTES.
- SEE DRAWINGS S2.3, S2.4, S2.5 & S2.7 FOR TYPICAL DETAILS.
- SEE DRAWING S3.1.1 FOR GROUND LEVEL FRAMING PLAN.
- PC1 ETC. DENOTES PILECAP TYPE. SEE DRAWING S2.4 FOR PILECAP SCHEDULE AND DETAILS.
- PILECAPS SHALL BE CENTERED AS FOLLOWS UNLESS NOTED OTHERWISE ON PLAN:
AT STEEL COLUMN LOCATIONS PILECAPS SHALL BE CENTERED AT COLUMN GRID INTERSECTIONS.
- TB1 ETC. DENOTES TIE BEAM. SEE DRAWING S2.5 FOR SCHEDULE.
- SEE DRAWING S4.2 FOR FRAME ELEVATIONS.
- C1 DENOTES HSS 12.75x0.5 COLUMN.
C3 DENOTES HSS 10x10x5/8 COLUMN.
C4 DENOTES W12x58 COLUMN.
C5 DENOTES HSS 8x6x9/16 INCLINED COLUMN.
C5B DENOTES HSS 8x6x9/16 INCLINED AND BENT COLUMN.
BC1 ETC. DENOTES BUILT-UP COLUMN. SEE DRAWING S4.1 FOR DETAILS.
- BP1 ETC. DENOTES COLUMN BASE PLATE TYPE. SEE DRAWING S4.1 FOR DETAILS.
- REFER TO DRAWING A1.4 FOR GEOMETRY/ORIGIN PLAN.



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| | MASSACHUSETTS BAY TRANSPORTATION AUTHORITY CHARLES/MGH STATION - RED LINE ACCESSIBILITY AND MODERNIZATION PROJECT MBTA CONTRACT NO. A410N01 | |
| | FOUNDATION FRAMING PLAN - PART A | |
| BLUES/MANFREDI HR PROJECT MANAGER DATE: 6/18/00 | MANFREDI HR PROJECT MANAGER DATE: 6/18/00 | PLAN NO. 142370 SHEET S3.1 OF |